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Reorganization and Debt Evasion

"Alarming" is the word applied by one of the justices of the Supreme Court in dissenting from the prevailing opinion handed down this week in the case of John H. Boyd versus the Northern Pacific Railroad Company. And from the viewpoint of those who by a "reorganization" have sought to escape from an unprofitable contract or to evade their debts the word is not too strong. The court, the opinion of which was approved by a narrow vote of five to four, after remarking that "corporations insolvent or financially embarrassed often find it necessary to scale their debts and readjust stock issues, with an agreement to conduct the same business with the same property under a reorganization," holds that "of course such transfer by stockholders from themselves to themselves cannot defeat the claim of a non-assenting creditor. As against him, the sale is void in equity, regardless of the motive with which it was made." What makes this decision so striking and of such wide application is that the plaintiff, Boyd, was the creditor of a corporation bought by the Northern Pacific Railroad Company and later transferred to its successor, the Northern Pacific Railway Company. In upholding Boyd's judgment against the corporation acquired by the railroad company the Supreme Court has, it appears, gone far toward making "reorganization" useless and unprofitable as a method of escaping creditors of the second as well as the first generation of a corporation's existence.

Delays in Patent Cases

As an example of the delays possible under the workings of our patent system and the attendant abuses, we commend to all interested in patent reform, and especially to the patent committees of Congress, the history of the Thomson patent for a system of electrical distribution recently held invalid by the United States District Court in Pittsburgh, as mentioned elsewhere in our columns this week. The date of invention, as claimed, was 1879, but the patent application was not filed until six years later, or in 1885. Complicated interference proceedings ensued, the matter being before the Patent Office for some eighteen years. Litigation in the courts against an alleged infringer consumed ten years more, with the final result that the inventor or his assigns were held to have no exclusive rights whatever. Leaving aside the inventor's delay of six years in filing application, which naturally prejudiced his case, seventeen years elapsed before issue, and twenty-seven years elapsed from the date of application to the adjudication by the court. Had the patentee's claims been sustained, his monopoly would have been extended to a total period of thirty-four years, or double the life of the patent. Another phase of this remarkable case is the fact that if the patent had been sustained, practically every constant-potential distribution system in the country and a very large portion of the industry would be monopolized by the plaintiffs for a further period of seven years, or until 1920. On this point the court said with great force that so useful and valuable is the system described and claimed by the patentee that he ought to give some satisfactory reason for the delay of twenty-seven years from the date of his application to the time of testing the validity of the patent on final hearing. But the end of this litigation has not necessarily been reached, since appeal in such a case, involving as it does the federal law, may finally be taken to the highest court in the land.

Monopoly in Energy Supply

Ever since central-station generating plants began to be established a vital engineering interest has surrounded the problem of the relative advantage of consolidating the generating stations of a community into one or a few plants as compared to the operation of a number of smaller plants each supplying energy throughout its limited area or to a single industry. The trend of development for thirty years has been very much in the direction of a more centralized supply and away from the establishment and maintenance of smaller plants, but the economic battle between the two methods has always been active and is no less active to-day than before. Recently interest in this problem has been added by the activities in Illinois and elsewhere in the direction of creating networks of transmission lines supplying energy over large areas for all purposes. The determination of the extent one should go in the direction of centralizing generation into a few plants for a given territory involves the balancing of the fixed charges on transmission-line investment necessary with one large plant, on the one hand, against the higher operating cost and higher fixed charges on the first cost of several small generating plants, on the other. The large generating plant nearly always has a decided advantage in better efficiency. Its first cost per kilowatt of peak load is lower than that for the smaller plants, and in addition the large station can take advantage of the diversity-factor so that the large station does not need to be of as large a total rating as the aggregate of the smaller stations it would replace. The transmission-line investment, which is indeed the key to the whole situation, has been rather lightly touched upon in some recent discussions of the subject. It is here assumed that the transmission lines erected would be of sufficiently substantial character to make possible as reliable a service from a centralized plant as would otherwise be rendered by smaller scattered plants. The reason that

centralized service has not been adopted to a greater extent heretofore has been that the cost of transmission lines is so great that comparatively few centralizing movements could economically be carried out on a small scale with the rather uneconomical existing plants and with the load actually connected to the small central stations operating in the territory. The success of such movements as are going on in Illinois will depend on something more than a mere tying together of the existing central-station loads. It will depend upon operating on a much larger scale than heretofore, on the building up of motor business not before obtained or obtainable by smaller central stations, and on obtaining lighting and motor business from farms and intermediate towns along the transmission lines where there has been no electric service heretofore. It is a movement requiring centralized ownership and a large amount of capital, a combination of essentials which until recently seems to have been lacking for the development of small town and farm business.

Spot-Testing Incandescent Filaments

In the early days of the carbon-filament incandescent lamp it was found very difficult to produce filaments of a sufficiently high degree of uniformity to give satisfactory life service. If a filament had a length of say 150 mm and there happened to be one thin spot or place where the cross-section was a little short, the current density at this spot would be above that in the rest of the filament and the working temperature at this spot would exceed the temperature elsewhere. Consequently, when the filament, judged as a whole, was operated at normal working temperature, the thin spot would be at an excessive temperature. The life of the filament would probably be much reduced owing to the presence of this hot spot.

It was not easy to perceive a hot spot in a carbon-filament lamp at full candle-power. The filament as a whole was so bright that an extra element of brightness had to be very marked to be detected in this way. By bringing the filament electrically to dull red heat during the later stages of evacuation on the pump it was fairly easy to see either hot or cold spots. It was subsequently discovered that if this process was conducted at a time when a suitable hydrocarbon vapor was introduced within the lamp chamber a glowing temperature would serve to decompose the vapor and deposit carbon. In this way, the thin glowing hot spots were forced to gather accretions of deposited carbon, and after such treatment hot spots could be made to disappear, although the filament after the "flashing process" gained somewhat in diameter throughout.

A delicate method of detecting spots or inequalities in the brightness of a filament is described by Mr. C. F. Lorenz on page 932. It consists essentially in providing a luminous color background for the filament in such a manner that when viewed against this background differences in brightness are thrown into effective contrast. In this sense the filament is subjected to optical pyrometry in successive portions.

It might be possible to carry the process described to a further degree of refinement, and to measure, at least approximately, by optical pyrometer methods, the differences of temperature at different portions of a filament. It has been demonstrated that an appreciable lowering of temperature occurs close to the ends of the filament where they terminate in the clamps, and also near to the anchoring clips, if any are used to support the filament. Such an effect must be looked for, in view of the conditions of heat conduction. Such reductions of temperature, while they lower the efficiency of the lamp, do not ordinarily lead to the troubles accompanying hot spots. It would be advantageous, however, in the case of standard lamps used in photometry to know the degree of non-uniformity in different portions of the filament. Even aside from special or standard lamps, it would be advantageous to be able to measure or specify the range of temperature variation along a filament at normal voltage.

Electricity in Mines

A group of papers at the recent Pittsburgh meeting of the American Institute of Electrical Engineers dealt with various phases of the supply of electrical energy for mining operations. As our readers well know from many articles published in these columns, the increase of electrical service in mines during the last ten years has been very marked, and many plants have been established, both for local service and for supplying energy to groups of mines. A most important phase of the Pittsburgh discussion was the emphasis laid on the use of central-station service for mines in preference to steam service produced even by the cheapest of local fuel. The time has gone by when any scattered industrial plant can afford to use locally generated steam power for its various classes of service, and coal mines, despite the fact that fuel is almost waste produce, generally use this fuel under such extraordinarily uneconomical conditions that there is positive gain in taking up electrical service where it can be obtained at any reasonable price. One of the authors pointed out that it is a conservative statement to say that from 25 lb. to 30 lb. of fuel is burned in a steam-operated coal mine for every effective hp-hour used. This figure would be almost unbelievable were it not cited in cold blood in the course of analysis of economic conditions. The cause of such frightful lack of economy is that the boilers are usually small, overloaded and improperly handled by poorly paid and inefficient firemen. The steam lines are often preposterously long, with consequent enormous waste of heat, and the whole steam plant has usually grown up piecemeal, with the usual unhappy results.

In passing to electrical drive with a single centralized generating equipment for the mine there is evidently large opportunity for gain, but the plants are not usually large enough to be economically worked and the load-factor seldom exceeds 50 per cent, on which basis the fixed charges and operating expenses on a plant of from 500 hp to 1000 hp rise to a somewhat serious figure—in the vicinity of 1 cent per kw-hr., even with fuel at 75 cents per ton. On the other hand, as has been many times proved, a large distributing plant, with the advantage of cheap fuel and such a diversity-factor as would be incident on the service

of many mine customers, is able easily to furnish energy in large blocks at a lower figure than that named. A large amount of service of this kind has now been built up with satisfactory results from the standpoints of all concerned. The central station furnishes, on the whole, not only cheaper energy than the isolated plant, but more reliable service and is particularly convenient in the matter of isolated motor units such as are required for pumping and temporary work, which is peculiarly expensive and troublesome to manage without a centralized energy supply.

For a long time in the early days of the application of electricity to mining there was a hue and cry about the danger of electrical operation. That accidents from shocks, fire and explosions have occurred from electrical causes is not to be denied, but as a matter of fact accidents of any kind due to electrical causes are so insignificant compared with the accidents due to other causes in mining operations that they have turned out to be of comparatively little account. No cause of accidents can fairly be called negligible, but there seems to be a strong probability that the introduction of electric service on the whole produces improved working conditions that lessen the aggregate number of accidents of all kinds. A mine fairly well lighted, provided with electrical tramways and coal-cutting machines, with electrical pumps and hoists, can unquestionably turn out more tons of coal per accident than a mine operated in the old-fashioned way, and this condition means a great gain in safety in conducting mining operations. Now and then a miner may receive a shock from a trolley wire or some charged part of a machine, but, on the other hand, with the old-fashioned equipment, he stands a far greater chance of getting hit by a pick, kicked by a mule or killed outright by an explosion due to a mishandled fuse which would not have occurred had electric ignition been employed. Mining at best is not a safe business, yet we believe it can readily be shown that a first-class electrical equipment on the whole materially diminishes the number of accidents in proportion to the output delivered. Altogether the coal mines are steadily increasing in importance as consumers of central-station energy.

The Cadmium-Amalgam Vapor Lamp

Ever since the development of the mercury-arc lamp persistent efforts have been made to remedy the deficit of red in the light produced so as to give more nearly normal color values to the objects illuminated. Efforts in this direction have been principally along three quite separate lines—the addition of red through independent light sources, as in the familiar combinations of mercury-arc and incandescent lamps; the transformation of part of the radiation into longer wave-lengths through fluorescence, as in Dr. Peter Cooper Hewitt's light transformer, and, finally, through the addition of light-producing vapors giving a larger proportion of red radiations than does mercury. As is well known, the mercury-arc lamp in glass gives practically no red rays. Worked intensively in quartz tubes the red radiations rise in intensity faster than do the green and blue radiations, so that the quartz-tube lamp, while yet far from giving a red component of what one might call normal intensity, still is much better in color than is the ordinary mercury-arc lamp. For example, it appears brilliantly red when observed through a red glass, although obviously lacking in red rays when used for the observation of miscellaneous colors.

A recent paper by Dr. Wolfke gives the result of some interesting experiments carried out in conjunction with Mr. Ritzman and the famous firm of Carl Zeiss, directed toward the production of white light in a metallic vapor lamp. This plan has frequently been tried, amalgams being used instead of pure mercury, but the trouble has been that most of the elements fairly rich in red radiations—for example, the alkali metals and those of the alkaline earths—attack the tube and render it inoperative within a very short time. Most other available metals have such high melting points as to render the lamp slow and somewhat troublesome in starting, if it does not give trouble in other respects.

Dr. Wolfke's researches have proceeded along the line of the fusible alloys, beginning with Wood's metal and running through the considerable range of similar compounds containing bismuth, zinc, cadmium, lead, thallium and mercury. It very soon appeared, as might reasonably have been expected, that low melting point is only an incident to the successful prosecution of the search for better material. Of far more importance is the production of homogeneous vapor at a reasonable working temperature. Finally, the experimenters settled on cadmium as the most suitable material. The vaporizing point of this in vacuum is about 450 deg. C., its melting point in air being 320 deg. The spectrum of cadmium contains one strong deep-red line, much stronger relatively than the red mercury line. With intensive working this line increases in brilliancy, as does also the red mercury line, so that in working with pure cadmium under these circumstances the tube appears red. This tendency is corrected by a very slight addition of mercury, which is stated to bring the color again into balance.

Some interesting data are given with respect to the performance of this lamp. The specific consumption is stated to run as low as 0.16 watt per candle in a lamp taking 620 watts and giving 3800 cp. As in the case of the ordinary quartz-tube lamp, the efficiency rises rapidly as the tube is worked more intensively. In the lamp referred to both poles are of the cadmium-mercury alloy. Experiments made with a graphite anode show less valuable results in efficiency. The relation between intensive working and efficiency seems to be about the same as in the quartz-tube mercury-arc lamp. How far the practical details of the lamp, particularly with respect to its starting, have been worked out seems at present uncertain, although several means of starting are described as feasible. Obviously, there are many practical matters to be considered before this very interesting lamp can have a definite position as a commercial illuminant assigned to it, but the research is certainly a very striking one, showing at least the theoretical possibilites of metallic-vapor lamps and indicating a range of efficiencies of a highly encouraging character.

The News of the Week

Activities and Events in the Electrical Field—Reports of Meetings—Commission Findings, Etc.

Electrification of the Norfolk & Western Railway

As mentioned in last week's issue, the Norfolk & Western Railway has authorized the electrification of a portion of its mountain division. This will include the most congested section of the main line, and upon it will be handled a freight traffic that is one of the heaviest in the country. The electrified zone will extend from Bluefield, W. Va., across the summit of the Alleghanies to the town of Vivian, W. Va., which lies on the western slope of the mountains.

The problems involved by the local conditions are unusual. The use of a third-rail is said to be impracticable because the line runs through a number of mining towns at street level and because there is in addition a large and extremely busy yard where coal trains are made up. It will, therefore, be necessary for an overhead conductor to be used whether the system adopted is single-phase, three-phase or direct-current.

The service will naturally be of the heaviest class yet considered in connection with electrification, as 3250-ton trains are contemplated and these, on the 2 per cent grades, will require a total drawbar pull per train of approximately 150,000 lb. To handle the traffic twenty-five electric locomotives of exceptionally high power are to be purchased, the design to depend to some extent upon the electrical system installed. These will be used for both switching and main-line service as the 30 miles of route to be electrified contains enough yard trackage and sidings to bring the total single-track mileage up to 75. The service is, however, to be designed exclusively for freight trains as the coal shipments are far in excess of the passenger traffic on this section of the railroad.

Preliminary Program for the N. E. L. A. Convention

Although the actual program for the convention of the National Electric Light Association at Chicago, June 3, 4, 5 and 6, has not been definitely settled so far as the arrangement of subjects by days and sessions is concerned, it is certain that there will be between sixty and seventy separate matters taken up and disposed of. As has been customary for years, the exhibition of apparatus will be opened on the night before the convention proper and followed by the reception to the president. There will be two sessions daily with two and three sections meeting in parallel as a general rule. The annual ball game is planned for the afternoon of June 4, and it is proposed to hold the second session of that day in the evening.

The following is a list of the regular reports, addresses and papers to be presented: President's address, by Mr. Frank M. Tait; secretary's report and progress report, by Mr. T. C. Martin; treasurer's report, by Mr. W. W. Freeman; insurance expert's report, by Mr. William H. Blood, Jr.; public policy committee's report and library committee's report, by Mr. Arthur Williams; constitution and by-laws committee's report, by Mr. Frank W. Frueauff; rate research committee's report, by Mr. E. W. Lloyd; membership committee's report, by Mr. Holton H. Scott; question box editor's report, by Mr. S. A. Sewall; accounting committee's report, by Mr. E. J. Bowers; prime movers committee's report, by Mr. I. E. Moultrop; lamp committee's report, by Mr. Frank W. Smith; meter committee's report, by Mr. W. H. Fellows; report on the grounding of secondaries, by Mr. W. H. Blood, Jr.; report on electrical measurements and values, by Dr. A. E. Kennelly; overhead-line construction committee's report, by Mr. Farley Osgood; report of committee on electrical apparatus, by Mr. L. L. Elden; report of committee on terminology, by Mr. W. H. Gardiner; report of committee on underground construction, by Mr. W. L. Abbott; report of committee on street lighting, by Mr. John W. Lieb, Jr., and report of committee on memorials, by Mr. T. C. Martin.

Commercial Section

The work of the Commercial Section will include an address by its chairman, Mr. E. W. Lloyd, and a special address on the education and training of salesmen, as well as the following reports of committees: Finance, by Mr. T. I. Jones; publication, by Mr. Douglass Burnett; membership, by Mr. J. F. Becker; electrical salesman's handbook, by Mr. E. L. Calahan; electricity on the farm, by Mr. John C. Parker; wiring of existing buildings, by Mr. R. S. Hale; ice and refrigeration, by Mr. G. H. Jones; electrical merchandising, by Mr. T. I. Jones; short cuts in executing customers' orders, by Mr. G. C. Holberton; steam heating, by Mr. S. M. Bushnell; advertising, by Mr. J. R. Crouse, and education of salesmen, by Mr. George Williams.

Hydroelectric and Power-Transmission Section

The work of this section will include an address by the chairman, Mr. W. N. Ryerson, and a special discussion before the section by an engineer from the Bureau of Standards of the subject of life hazard in connection with the transmission and distribution of power, which the bureau is to study next July with an appropriation of $15,000 from Congress. The committee reports to be taken up are as follows: Receiving apparatus, by Mr. M. R. Bump; distributing lines, by Mr. P. M. Downing; operation of water-power systems, by Mr. D. B. Rushmore; membership, by Mr. R. J. McClellan; power-transmission progress, by Mr. T. C. Martin.

It is also proposed to discuss in this section the part of the report of the committee on prime movers relating to a special investigation of water-power plants and apparatus made by a sub-committee with Mr. J. F. Vaughan as chairman. The following papers have also been prepared: "Factors Producing Reliability in the Suspension Insulator," by Mr. A. O. Austin; "Transmission Lines," by Mr. R. D. Coombs; "The Mississippi River Power Company's System" (illustrated), by Mr. H. L. Cooper; "Lightning Arresters," by Mr. E. E. F. Creighton, and "The New Type of Thrust Bearing," by Mr. Albert Kingsbury. Some attention will be given to conservation, but the specifically political aspects of this will be reserved for the report of the committee on public policy.

Accounting Section

The work of the Accounting Section will include an address by the chairman of the accounting committee, Mr. E. J. Bowers, and the following papers and reports: "Handling of Freight Bills," by Mr. A. S. Scott; "Handling of Bond Coupons," by Mr. C. S. Mitchell; "Accounting for Replacement of Plant Retired from Service," by

Mr. F. E. Stevens; "Method of Keeping Prepaid and Accrued Accounts," by Mr. F. Heydecke; "Accounting Schools and Education of Employees," by Mr. Alexander Holme; "Office Mechanical Appliances," by Mr. H. B. Lohmeyer; "Obligations of the Bookkeeping to the Operating Department," by Mr. F. H. Patterson; "Pay-Roll Problems," by Mr. W. E. Freeman; report on the revised standard classification, by Mr. J. L. Bailey; joint report on statistics and forms, by Messrs. H. Spoehrer and C. L. Campbell.

MISCELLANEOUS PAPERS

The program includes a good deal of miscellaneous work and many papers which will either be taken up in the technical sessions, treated in the general sessions, or allotted to the sections within which they would naturally fall. An address is hoped for from Mr. Samuel Insull, of the Commonwealth Edison and other Illinois properties, on recent features of central-station evolution. A list of the proposed papers follows: "Anticipation," by Mr. Paul Lupke; "Central-Station Power in Coal Mines," by Mr. W. A. Thomas; "Switchboard Instruments," by Mr. Paul MacGahan; "Railway Loads for Central Station," by Mr. E. P. Dillon; "Transformers and Power Transmission," by Mr. H. H. Rudd; "Arc Lamps and Recent Developments Thereof," by Mr. W. A. Darrah; "Developments in Protective Apparatus," by Mr. J. N. Mahoney; "Latest Developments in Distributing Transformers," by Mr. E. G. Reed; "The Incandescent Lamp and Its Relation to Lighting Service," by Messrs. R. E. Campbell and W. C. Cooper; "New Incandescent Lamp Development," by Mr. J. E. Randall; "Use of the Telephone in Central Stations," by Mr. August Hibbard; "Poles and Pole Preservation," by Mr. R. A. Griffin; "Switching Apparatus for Rural Installations," by Mr. E. B. Merriman; "Central Stations for Towns of 5000 Population or Less," by Mr. J. Edward Kearns, and "Advantages of Copper-Clad Wire for Series Arc Lighting," by Mr. T. K. Stevenson.

There will be a special session devoted to the work of the company sections, or the matter may be given prominence in a general session. The proposal has also been made to have a special discussion devoted to the recent remarkable development of the holding company method and the ways in which through it the efficiency of the industry and improved service to the public can best be secured. One or two leading men have already intimated their willingness to contribute to the discussion, if it can be arranged. One special feature of the convention will probably be the invitation issued to public service commissions to attend and assist in its deliberations. The plans of the new Society for Electrical Development will also be presented by one of its leading officers.

Transportation Arrangements for N. E. L. A. Convention

The transportation committee of the National Electric Light Association, through its chairman, Mr. George W. Elliott, New York, has issued a circular containing information on trains, rates of fare offered by the various passenger associations, and the personnel of the transportation committee. The special train feature inaugurated last year will be continued this year, and six trains, to be known as the red, pink, golden poppy, maroon, purple and magnolia specials, have been arranged for. The "red" special will leave the Grand Central Terminal, New York City, June 1 and will be in charge of Mr. F. H. Gale, of Schenectady, N. Y., assisted by Mr. R. D. Lillibridge, New York City. The "pink" special will leave the Pennsylvania Terminal, New York City, on June 1 and will be in charge of Mr. J. C. McQuiston, East Pittsburgh, Pa., assisted by Mr. A. H. Manwaring, Philadelphia, Pa. The "golden poppy" special will leave from the Oakland Station, San Francisco, and will be under the personal direction of Mr. E. B. Strong, San Francisco, Cal. The train leaving from Kansas City, Mo., will be known as the "maroon special" and will leave Kansas City on June 1 over the Atchison, Topeka & Santa Fé Railroad. That train will be under the personal direction of Mr. E. J. Bowers, Kansas City, Mo. The "purple" special train will leave Union Station, St. Louis, and travel over the Chicago & Eastern Illinois Railroad, and Mr. H. Spoehrer, St. Louis, Mo., will have personal charge. Delegates attending the convention from North Carolina, South Carolina, Georgia, Florida, Alabama, Tennessee, Kentucky, Louisiana, Mississippi and Texas may travel on the "magnolia" special, leaving Atlanta, Ga., June 1 over the Southern Railway. That train is to be run under the special auspices and management of the Southeastern Section of the N. E. L. A. The master of transportation calls attention to the fact that it is essential to the comfort and convenience of members attending the convention and to the success of all the arrangements that have been made that immediate action be taken on transportation accommodations by those who are contemplating journeying to Chicago to attend the convention.

Thomson Patent for an Electric Distribution System Held Invalid

On April 18 Judge Orr in the United States District Court for the western district of Pennsylvania filed an opinion in the case of the General Electric Company versus the Butler Light, Heat & Motor Company holding invalid Patent No. 698,156, granted to Prof. Elihu Thomson for a "system of electric distribution," under date of April 22, 1903. The case is noteworthy both on account of its subject matter and because it typifies the long delays inherent in patent procedure and litigation which have become so prominent and toward the reform of which there has been so much recent agitation.

Briefly, the patent in question covered the combination of a pair of alternating-current distributing mains with transformers connected thereto in multiple relation and secondary circuits supplying energy to lamps, motors, or other devices. It covered the method of alternating-current distribution at constant potential now almost universally employed in central-station practice. The date of conception of such a combination on the part of the patentee, the constituent parts of which, however, were not new, was prior to May 16, 1879, the latter being the date of application by Brush for a patent which anticipated Thomson's claims. Thomson filed his application on Nov. 2, 1885, and after prosecuting his claims before the Patent Office finally came into interference with Brush, Halleck, Hunter and Freeman. Among the patents cited against Thomson's claims were United States patent No. 219,209, issued to Brush on Sept. 2, 1879; French patent No. 132,426, issued to Pizet on Aug. 27, 1877; United States patent No. 234,770, to Gordon on Nov. 30, 1880; United States patent No. 210,317, to Fuller in 1876; British patents No. 4212, to Bright, and No. 4611, to Edwards and Normandy, in the same year as the last, and British patent No. 5257, to De Meritens in 1878. The board of appeals in the Patent Office finally decided the issue of priority in Thomson's favor, and his patent was granted in 1903, after seventeen years of delay and litigation and twenty-three years after the date of invention.

The cause now disposed of by Judge Orr has been pending before the court for ten years, or since 1902. It was held in the opinion that "Thomson at most did nothing above the requirement of ordinary skill which should be found in those acquainted with the state of that art at that time. . . . What he did was no more than others

were doing and did not amount to invention by him. . . . The mere fact that he may have made connections which produced beneficial results, without there being novelty in the arrangement of the parts, must not be deemed to be invention." The opinion held the patent invalid by reason of prior publications, prior uses, lack of novelty or invention, and furthermore because of the patentee's delays and laches.

The suit against the Butler Light, Heat & Motor Company was defended by the Pittsburgh Transformer Company of Pittsburgh.

Convention of the Southwestern Electrical and Gas Association

The tentative program for the convention of the Southwestern Electrical and Gas Association to be held at Galveston, Tex., on May 21, 22, 23 and 24 has been announced. There will be parallel morning and afternoon sessions on May 21, the papers being devoted exclusively to railway and gas topics. At the morning and afternoon sessions of May 22 the following papers treating of electrical matters will be presented: "Erection and Protection of High-Tension Lines and Apparatus," "Oil Engines for Light and Power Plants in Small Towns and Cities," "Economical Operating of Light and Power Plants in the Small Town," and "The Proper Basing of Rates by Light, Power, Gas and Water Public Utilities in Texas."

A general session will be held on the morning of May 23, with a parallel session at the same time for accountants. At the general session the following papers are scheduled for presentation: "Fire Prevention as Fire Protection," "The Purification of Feed-Water for Steam Boilers," and the report of the secretary on the work accomplished and the future value of the secretary's office. The paper to be presented at the accountants' session will deal with the necessity of a standard system of accounting for the small and medium-sized public utilities of Texas. In the afternoon of May 23 the supply men's session and entertainment will be held. On the closing day of the convention reports of standing committees and temporary committees will be read and the election of officers and standing committees for 1913-14 will take place. The secretary of the association is Mr. H. S. Cooper, 405 Slaughter Building, Dallas, Tex.

Convention of the Oklahoma Gas, Electric and Street Railway Association

At the annual convention of the Oklahoma Gas, Electric and Street Railway Association, to be held at Oklahoma City on May 6, 7 and 8, the following papers will be presented: "Compensation of Gas Companies," by Mr. W. J. Dibbens, Guthrie; "Lightning Arresters," by Mr. W. B. Clayton, General Electric Company; "The 'Safety First' Movement," by Mr. George W. Knox, general manager Oklahoma Railway Company; "Relation of the Incandescent Lamp to Lighting Service," by Mr. J. W. Tabb, National Quality Lamp Division of the General Electric Company, Cleveland; "Solving the Small Power User's Problem," by Mr. J. W. Johnson, Wagner Electric Manufacturing Company, St. Louis; "Electric Oil Engines," by Mr. J. W. Dawley, treasurer and manager Hugo Ice & Light Company; "Electricity and Irrigation for Oklahoma Farms," by Prof. H. B. Dwight, University of Oklahoma; "Uniform Accounting," by Mr. Henry Wilmerding, Oklahoma Gas & Electric Company; "Liability Insurance," by Mr. F. H. Ellis, Kansas City, Mo.; "Legislation Affecting Public Utilities," by Prof. H. V. Bozell, University of Oklahoma, Norman, and "Gas Plant Operation," by Mr. W. H. Bagely, Tulsa. The Jovian Order of Oklahoma, of which Mr. A. V. Hancock is alternate statesman, will hold its rejuvenation during the convention. The headquarters of the Oklahoma association and also of the Jovians will be the Skirvin Hotel.

Meeting of Arkansas Public Utility Operators

At the annual meeting of the Arkansas Association of Public Utility Operators, which will be held at Little Rock May 5, 6 and 7, the following papers will be presented: "Operation of Small Central Stations," by Mr. W. H. Walkup, superintendent and chief electrician of the Batesville Electric Light & Power Company; "Relation of Public Utility Companies with the Public," by Mr. J. Walter Gillette, general manager of the Fort Smith Light & Traction Company; "Operation of Small Water Plants," by Mr. W. C. Maguire, manager of the Arkadelphia Electric Lighting Company, and Mr. E. T. Reynolds, superintendent of the Camden Power Company; "Benefits to Be Derived from the Association," by Mrs. La Salle Stoops, manager of the Stuttgart Water & Electric Company; "Modern Practice on Feeder and Voltage Regulation," by Mr. V. A. Hain, district regulator specialist General Electric Company, Chicago; "Effect of Tungsten Lighting on Revenue," by Mr. A. E. Main, superintendent electrical department Hot Springs Railway Company, and "Electric-Light Accounting Applied to Small Companies," by Mr. R. B. Fowles, auditor Pine Bluff Company.

Annual Report of General Electric Company

The twenty-first annual report of the General Electric Company, covering operations for the year ended Dec. 31, 1912, and including for the first time the business formerly conducted by the Fort Wayne Electric Works, the Sprague Electric Company and the National Electric Lamp Company, shows that the value of the orders received during the year was $102,934,788, while the amount of sales billed for the year was $89,182,185.80. Competition in the several lines of business has continued to increase with the result that the percentage of profit realized from the sales of apparatus has materially diminished.

There was a steady and nearly uniform increase in the number of orders taken during the year, which, exclusive of the Fort Wayne, Sprague and National Electric departments, numbered 466,895. To provide for the increasing volume of business, the manufacturing facilities of the company have been substantially enlarged—the factory floor area being now 12,160,000 sq. ft. Over 60,000 persons are in the employ of the company. An expenditure of $539,956.93 made during the year for the purchase of patents, for applications and licenses under patents and for miscellaneous patent expense has been charged to profit and loss, and the patent account remains at $1.

The stocks and bonds owned by the company have a par value of $23,013,764.54 and are carried at a book value of $23,325,070.38 at Dec. 31, 1912. The principal change from last year is the transfer into the various asset accounts of the General Electric Company of its investment in the National Electric Lamp Company. The book value of current accounts and notes receivable was $26,950,244.90 on Dec. 31 after making ample provision for possible losses. Of the accounts receivable only $558,224.92 represents the face value of unsettled accounts originating earlier than Jan. 1, 1912. From affiliated manufacturing and selling companies there was due $4,099,062.64, making a total book value of all accounts and notes receivable of $31,049,307.54. The book value of all the manufacturing plants of the company at Dec. 31, 1912, was $24,556,110.59. Of this $1 represents the value of furniture and fixtures, $1 the value of

patterns, $9,176,985.86 the value of machinery, and the rest is represented by real estate and buildings.

On July 25 the issue of $60,000,000 forty-year debenture bonds was authorized, and of these $10,000,000 bearing interest at the rate of 5 per cent per annum have been sold. The capital stock of the company has been increased by the conversion of $510,000 of the gold debenture bonds of 1907 and also by the issue of $2,500 of capital stock in exchange for $3,000 of the debentures of 1892. A stock dividend of 30 per cent out of surplus was declared on Oct. 11 for the purpose, it is stated, of recouping the stockholders in part for dividends passed or reduced during the years 1893 to 1902. The capital stock of the company on Jan. 1, 1912, was $77,335,200, and during the year there was issued in exchange for debentures $512,500, beside a stock dividend of $23,354,300, making the total capital stock issued $101,202,000. The reserve against debentures is $240,166.67 and the amount of stock unissued and unappropriated is $3,557,833.33, making the total authorized stock of the company $105,000,000. Quarterly dividends at the rate of 8 per cent per annum have been paid during the year. A condensed profit and loss account is given herewith.

PROFIT AND LOSS ACCOUNT, GENERAL ELECTRIC COMPANY

Sales billed		$89,182,185.80
Cost of sales		81,074,192.25
		$8,107,993.55
Interest and discount, royalties and sundry profits	$1,292,224.20	
Income from securities owned	1,241,256.72	
From increase in value of securities of companies owned, due to the increase in the surplus of those companies for the year; and profit on securities sold	2,469,348.97	
	$5,002,829.89	
Interest and discount on debenture bonds	532,087.18	
		4,470,742.71
		$12,578,736.26
Dividends paid		6,213,173.92
Net surplus for the year		$6,365,562.34
Surplus, Jan. 1, 1912		29,019,892.52
		$35,385,454.86
Less stock dividend		23,354,310.00
Surplus, Dec. 31, 1912		$12,031,144.86

Theories of Electromagnetic Radiation

Addressing the Electric Club of Chicago on April 17, Dr. R. A. Millikan, professor of physics in the University of Chicago, commented upon the rapidity with which during the last three years the results of the most advanced researches in the field of the conduction of electricity through gases have been utilized in electric lighting and other electrical industries. He prophesied increased cooperation during the next decade between the research man and the engineer. He traced the great advances which have been made within the last ten years in our knowledge of the nature of the electric charge and of the electric current, but declared that the nature of electromagnetic radiation is as yet but little understood.

Recent work has well-nigh demonstrated the essential identity, in all respects save that of wave-length, of X-ray radiation and light or heat radiation, but at the same time it has brought to light effects which seem to be quite irreconcilable with any theory of ether waves which pictures the radiated energy as distributed uniformly over the wave front. Such a spreading-pulse theory finds itself completely powerless to explain the now well-established fact that though both X-rays and ultra-violet light eject electrons from an exceedingly minute fraction of the molecules through which they pass, yet the energy which is imparted to the electrons which are ejected is completely independent of the intensity of the X-rays or of the light and is directly proportional to the hardness of the X-rays or to the frequency of the light.

While these and other newly discovered effects which were discussed do not seem to Dr. Millikan to point to a return to the abandoned corpuscular theory of electromagnetic radiation, the lecturer thinks that they do seem to indicate that some way must be found to reconcile the long familiar properties of ether waves, such as the properties of interference, polarization, etc., with the property of transmitting energy in bundles or units which maintain the same intensity along the line of propagation no matter what the distance from the source may be. A great deal of the recent work of the physicist seems to indicate that we are on the verge of learning more than we have hitherto known about the nature of that mysterious vehicle, commonly called the ether, which transmits electromagnetic waves through space. So far we know nothing whatever about it save that it is the carrier of electromagnetic energy.

Annual Banquet of Engineers at Boston

The fourth annual banquet of the Boston sections of the American Institute of Electric Engineers, the American Society of Mechanical Engineers and the Boston Society of Civil Engineers was held at the Boston City Club on April 29, the guest of honor being Prof. Ira N. Hollis, of Harvard University, president-elect of the Worcester Polytechnic Institute. The speakers, all of whom emphasized the growing importance of technical education and the rising standards of the engineering profession, were President Lowell of Harvard University, President Maclaurin of the Massachusetts Institute of Technology, Dr. Hollis, Hon. Charles G. Washburn, Acting President W. L. Hooper of Tufts College, Rear-Admiral Francis C. Bowles and Mr. Matthew C. Brush, second vice-president of the Boston Elevated Railway Company. The toastmaster was Mr. James W. Rollins, Jr.

Convention of Mississippi Electric Association

The fifth annual convention of the Mississippi Electric Association was held at Natchez, Miss., April 21, 22 and 23. Delegates to the convention met at Vicksburg on April 21 and embarked on a river steamboat for Natchez. The opening session was held on the steamboat. The address of the president, Mr. R. B. Claggett, of Greenville, was followed by reports of committees on electric heating and meter testing. An address of welcome was made by the Mayor of Natchez when the delegates assembled in that city on April 22, followed by a paper entitled "Large Power Contracts," by Mr. A. B. Patterson, of Meridian. The afternoon session was given over to reports of committees on line construction and the grounding of secondaries. The report of the secretary-treasurer was also read at that session. Reports of committees on membership, insurance and public policy were presented at the opening session of the closing day and the following papers were read: "Single-Phase Motors," by Mr. J. F. Jones; "Lubricating Oils," by Mr. W. A. McWhorter, and "Ornamental Street Lighting in Small Cities," by an engineer from the National Electric Lamp Association. Officers for the ensuing year were elected as follows: President, Mr. W. F. Gorenflo, Gulfport; vice-president, Mr. A. H. Jones, McComb, and secretary-treasurer, Mr. F. J. Duffy, Natchez. The convention closed with a banquet at the Natchez Hotel.

Convention of Iowa Electrical Association

Meeting as a section of the National Electric Light Association for the first time, the Iowa Electrical Association held its thirteenth annual convention at Waterloo, Iowa, on April 23 and 24. The sessions were held in the new building of the Citizens' Gas & Electric Company, the main floor of which was given over to exhibits. Mr. W. H. Thomson, Jr., general manager of the Des Moines Electric Company and president of the association, opened the convention with his address, in which he enumerated several advantages to be derived from being affiliated with the N. E. L. A. He said also that the public and the corporation can best be protected by a utilities commission consisting of men of the same caliber as supreme court judges. Instead of five men each of whom draws a salary of $3,000 a year, Mr. Thomson believes that better results would be obtained with three men drawing a salary of $5,000 a year. The smaller electrical companies, not being considered as octopuses, and being thereby better fitted to mold public opinion than the larger corporations, were considered to be very desirable members of the association by Mr. Thomson.

Mr. H. E. Kiester, president of the Town Criers' Club of Waterloo, delivered an address of welcome to which Mr. H. C. Blackwell, of Davenport, responded. The remainder of the morning session was taken up with routine business.

As is customary each year, the Iowa Electrical Association selects the next year's meeting place and awaits an indorsement by the Iowa Street & Interurban Railway Association in order that the two conventions may be held at the same place and overlap. On the invitation of the Commercial Club of Cedar Rapids, both associations will meet in that city next year.

The reports of several committees were submitted at the afternoon session. Mr. T. A. Fish, chairman of the committee on grounded secondaries, said that the N. E. L. A. report on that subject could hardly be improved. A driven pipe not having more than 12 ohms resistance to ground is considered the best medium except where connections can be made with a water main.

Motor Load

"Off-Peak Possibilities" was the title of the paper delivered by Mr. C. W. Drake, of the Westinghouse Electric & Manufacturing Company. Several interesting figures comparing the motor load of a manufacturing state with that of Iowa, an agricultural state, were given. The population per horse-power in Iowa is fourteen, while in Rhode Island it is two. On a basis of 1 hp per sq. mile these same states have 3 and 212. Iowa compares with the average state, however, in having 12 per cent of the total primary horse-power connected to central stations.

Discussion

A short discussion followed in which Messrs. W. J. Young, R. E. Lee, W. H. Thomson and H. C. Blackwell took part. The main topic discussed was how to keep certain consumers off the peak.

Welfare Work

Mr. E. M. Walker, of Dubuque, read a paper on welfare work for employees, in which he said that the movement cannot help but result in mutual benefit. Maximum efficiency can result only when there is a humane bond between master and worker. Different forms of welfare work, such as club rooms, mutual benefit funds and pension lists, have been successfully practised. Investment clubs offering opportunities to employees for obtaining increased profits on their savings have met with success in several instances. Co-operative buying of all necessities of life has lowered the living expense of employees in large cities.

Discussion

In the discussion which followed Mr. Thomson told of a practice instituted in Des Moines recently whereby any grievance or question which an employee wished to take up with the general manager is handled through a question box. The need of such a system is evident as the growth in population in many of the cities has prevented the intimate contact of employer with employee. Mr. Blackwell said that the People's Light Company, of Davenport, has conducted bi-weekly meetings for department heads and monthly meetings for employees, the purpose of which is to familiarize those present with the manner in which business is conducted. Messrs. Austin Burt and H. W. Garner also took part in the discussion.

Facts and Factors

Mr. Austin Burt's report on facts and factors was read at the morning session on April 24 by Mr. I. L. Craig. It consisted of tabulated data compiled from reports sent in by central-station companies from thirty-eight towns in Iowa having from 750 to 90,000 population.

This coming year advantage will be taken of the offers made by Professor Fish, of the Iowa State College at Ames, to send representatives to central stations in Iowa to obtain data for the committee on facts and factors. It is hoped that by personal interviews some of the erratic figures hitherto obtained by mail will be eliminated.

Feeder and Voltage Regulation

Mr. V. A. Hain, of the General Electric Company, read a paper on modern practice on feeder and voltage regulation, which was accompanied by pictures and curves. The effect of change of voltage on the candle-power and energy consumption of carbon and tungsten lamps was shown in figures and graphically. Poor regulation causes dissatisfaction on the part of the consumer and means a loss in revenue to the system. While a motor will ordinarily adjust itself to changes in voltage and carry the load, yet it means a higher I^2R loss through the whole system. Views and wiring diagrams showing connections of switch-type, induction-type and outdoor-type voltage regulators accompanied the lecture. Figures on the saving in feeder conductors when regulators are used were given.

Discussion

Mr. Austin Burt, general manager of the Citizens' Gas & Electric Company, of Waterloo, gave a description of the company's power plant and substations, in which remarkable results are being obtained with regulators in the primary circuit of a four-wire, delta-connected, grounded-secondary distribution system.

Line Extensions in Rural Districts

A paper on factors determining rural line extensions was read by Mr. J. M. Drabelle, of Cedar Rapids, who said that the development of rural transmission lines will progress much more rapidly when reliable and cheaper high-tension apparatus is put on the market. On account of the high initial investment required for high voltages, Mr. Drabelle believes that 6600 volts is the limiting tension for any rural distribution line. He gave the cost of constructing pole lines and stringing wires for 2300-volt to 6600-volt systems as being from $325 to $425 per mile. The density of population being a major factor in line extensions, at least one customer per half mile should be obtained. For strictly rural service he advised having farmers construct their own lines. Where electricity is to be transmitted to a distant point, he felt it best to build the line first and canvass the farmers along the route later. A form of contract used by the Cedar Rapids & Iowa City Railway & Light Company for this service was read.

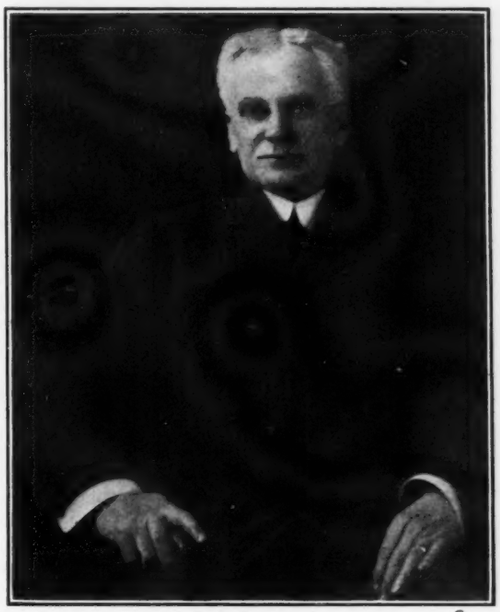
High-Tension Transmission Lines

The paper read by Mr. H. W. Garner, general manager of the Oskaloosa Traction & Light Company, of Oskaloosa, was on the detail and design of high-tension transmission lines. The paper consisted of a résumé of the present types

of line construction in Iowa, some details of transmission-line construction and the actual cost of a 11,000-volt steel pole line being given. The style and cost of construction of small lines should to a certain extent depend on the probable amount of revenue obtainable from the localities supplied. For lines radiating from one small locality to other small towns, Mr. Garner advised the use of wooden-pole, single-phase lines at prices ranging from $500 to $1,200 per mile complete. For lines radiating from large central stations to various localities with prospective extensions, he advised the most sturdy type of construction protected by every device which will aid in giving reliable service.

An 11,000-volt, three-phase line running from Oskaloosa to New Sharon on steel tripartite poles a distance of 16 miles was constructed by Mr. Garner in 1912. The average cost of construction was $982 per mile.

Mr. Rufus E. Lee, general manager of the Lee Electric Light Company, of Clarinda, spoke on the details of operation and maintenance of high-tension transmission lines. To prevent short-circuits on lines, he said that all trees which are close enough to the line to cause trouble should be cut down. When this is not possible the line should be run above them. Grading should be done where practicable to prevent strain on the wires. Where extra safeguard is desired, as over highways and railroads, the spans should be made short and of extra-heavy wire double-tied to insulators. In order to locate trouble along transmission lines in a better way than when it is reported by farmers, he advised having blueprints made showing the relation of the line to the adjoining farms. On a 13,200-volt transmission line built by him 23,000-volt insulators are used as an additional precaution against lightning, and in tying line wires on insulators two sets of Buffalo grips are used to avoid breaks due to nicks in hard-drawn copper conductor. Where there are several fairly well populated rural districts close together alongside of a high-tension transmission line, Mr. Lee suggested running a 2300-volt line parallel to the main line and feeding it from the center each way with standard transformers. Each rural district can then be supplied with electricity from the 2300-volt line through standard instead of special transformers. Data were given on the cost of constructing a line running east from Clarinda on steel tripartite poles set in concrete. An average of $600 per mile was expended on the first 15 miles of the line and $800 per mile on the last 17 miles. Long haulage of poles and construction supplies is said to account for the increased cost on the latter.



H. P. DODD

Discussion

The extent of the liability of companies transmitting high-voltage electricity as regards telephonic disturbance was the subject of the discussion which followed. It was held that telephone companies must show modern line construction before the transmission company is liable for any disturbance. Mr. Lee said that his company assisted in moving a telephone line half a mile away to avoid disturbance. Mr. Drabelle believed it sufficient to have lighting and telephone lines on opposite sides of the road.

Mr. Lee claimed that it is profitable to extend a line 7 or 8 miles to supply 500 people with electricity in case a ten-year contract for street lighting in the district accompanies the extension. He also believed that the Iowa association should suggest the voltage above which insulation should not be required on high-tension lines.

Equipment of Alternating-Current Switchboards

Prof. A. H. Ford's paper on the equipment of switchboards for parallel operation of alternators was accompanied by vector diagrams showing the effect of changes in field excitation on the power-factor. A diagram of a switchboard for parallel operation was shown, which Professor Ford recommended for both large and small stations.

Discussion

In the discussion Mr. McMillen spoke of replacing the power-factor meter by a meter which could indicate either the power reading or the wattless component of the power. Mr. Drabelle suggested using one ammeter which could be thrown into any phase desired.

Election of Officers

At the executive meeting which followed this discussion Messrs. A. L. Dodd, of Charles City, and Rufus E. Lee, of Clarinda, were announced as being elected to the offices of president and vice-president respectively. Mr. Dodd is secretary and manager of the Charles City Light & Heat Company and is one of its largest stockholders. Previous to the eight years which he has spent in the service of that company he was connected with the Illinois Central Railroad. Messrs. H. B. Maynard, of Waterloo, and W. A. Mall, of Belle Plaine, were re-elected secretary and treasurer respectively. Two changes were made in the executive committee; Messrs. A. D. Ayres, of Keokuk, and F. C. Ross, of Carroll, were appointed.

Entertainment Features

Directly following the afternoon session on April 23 those attending the convention were taken for an automobile ride around the residence and business districts of Waterloo.

In the evening the members of the association were the guests of the Citizens' Gas & Electric Company at a theater party. After the theater practically everyone attended a smoker held in the new building which the local electric company has just constructed.

On April 24 two interurban cars of the Waterloo, Cedar Falls & Northern Railway Company were chartered, and all attending the convention were taken out to the Citizens' Gas & Electric Company's generating station, where Mr. Burt personally conducted a tour of inspection.

Mr. J. N. La Belle, of the National X-Ray Reflector Company, gave an illustrated lecture in the evening on indirect-lighting fixtures before an assembly consisting of members of the association and the public. This lecture was similar to the one given at the Minnesota convention on March 11 to 13. (See *Electrical World* for March 22, 1913.)

On the Tuesday morning preceding the convention a party consisting of about sixty members of the Iowa association, headed by Mr. A. D. Ayres, manager of the Keokuk Electric Company, visited the new hydroelectric generating station, the local electric company's station and other points of interest at Keokuk.

Pittsburgh Meeting A. I. E. E.

The account published last week of the Pittsburgh meeting of the American Institute of Electrical Engineers gave a summary of the proceedings up to the afternoon session on April 18. The remaining papers and discussions of the meeting are given in abstract below.

Central-Station Energy for Mines

According to the author, Mr. J. S. Jenks, central-station service has been very greatly handicapped for use in mines by the prejudice of mine inspectors and by engineers who maintain it is not reliable and is more dangerous and more costly than other forms of energy. It requires a period of years to demonstrate the reliability of central-station service to them, and even after the operators are convinced the inspectors often prohibit its use for one reason or another.

After describing his company's early installations, Mr. Jenks said the West Penn system has now seventy-six coal mines on its lines with an aggregate load of 14,831 hp and is at present connecting ten installations with a total of 5701 hp, making a total of 20,532 hp. Mr. Jenks hopes soon to have 30,000 hp of coal-mining load on the company's lines.

Characteristics of Substation Loads at the Anthracite Collieries of the Lackawanna Railroad

A series of tests were made by Messrs. H. M. Warren and A. S. Beisecker on the substations which supply energy to the direct-current machinery in the mines of the Lackawanna Railroad, and the details appear in their paper. Fifteen of the substations, varying in size from 150 kw to 700 kw, were covered. Following a short description of the substation equipment and of the various classes of machinery operated with it, there is given an explanation of the method and scope of the tests. The variations in diversity and load factors were studied particularly, and the results of the tests along these lines are summed up in three sets of curves, showing relative variations for fixed periods. The economic significance of the tests is brought out. From their observations the authors advise in general against the installation for this class of work of a converter smaller than 200 kw and state further that, in case there is a probability of the load growing rapidly, a 300-kw unit will be cheaper eventually. They also say that, even though the initial cost may be greater, the installation of a motor-generator set instead of a converter will often work out advantageously in the long run, owing to improvement of the power-factor and of both the alternating-current and direct-current voltage regulation.

Discussion

In the discussion of the last paper Mr. Bright stated that the integrated peak and not the block peak was the proper one for determining the fixed charge.

Mr. Thomas thought there should be a common basis of understanding of the proper definition of load-factor, thus eliminating the trouble of changing from one definition to another.

Mr. Clayton said, in referring to Mr. Beers' paper, that a mine with a load-factor of 50 per cent secured energy at a cost of 0.008 per kw-hr., whereas had the load-factor been 20 per cent the cost would have been 1.8 cents, and if the load-factor had been 15 per cent the cost would have been 2.4 cents per kw-hr., assuming in these figures 43,800 kw-hr. A load-factor even of 20 per cent would hardly be secured in an average installation in Illinois, and he believed that the publication of such costs was likely to create a wrong impression unless the load-factor was given at the same time.

Mr. Pen Dell said load-factor is the ratio of the average load for twenty-four hours to the maximum demand, which later may extend over a period of five minutes or an hour. A load-factor of 40 per cent on a five-minute peak would become 85 per cent on a thirty-minute peak. Some contracts are based on a peak of one duration and some on a peak of another, but the formula remains the same and has nothing whatever to do with the size of the installation. The integrated peak is the only proper one for determining maximum demand. Peaks of five, fifteen, thirty and sixty minutes are all in common use, each one for a specific service, the last one being used for large interurban railways and similar service.

Chairman Wood said he was not surprised that the coal operator was often dubious about the rates and would not blame him if he insisted on a rate based on a ton of coal mined.

Mr. Lincoln called attention to the one-minute peak, in addition to those mentioned, used by the Niagara, Lockport & Ontario Power Company. He believed load-factor is a function of the load and equals the average kilowatt-hours divided by the kilowatts integrated over any given time and not restricted to any period of time.

Mr. Pen Dell did not agree with the chairman on the proposition to base price of energy on the tonnage of coal, as it placed all the risk for inefficient operation of the mine on the central station. The company with which he is connected (the Public Service Company of Northern Illinois) takes customers on a basis of 75 per cent power-factor. The operating department had suggested the use of synchronous machines for mine customers to boost the power-factor, but the commercial department had objected, owing to complications, and claimed that if the company wanted to correct power-factor it could put machines in its own plants. He described an instrument for measuring the peak which makes use of a clock set to indicate the time and which automatically stamps the value of the peak through a typewriter ribbon. He formerly used graphic meters but took them out on account of the too close reading necessary where large values are involved.

Electricity as Applied to Mines from a Practical Standpoint

Judging from the applause it received and the laughter it created, perhaps the most interesting paper, in many ways, of the meeting was that presented at the opening of the Saturday session by its author, Mr. J. W. Hopwood.

The author said that the location of the mine had a great influence on the quality of labor employed. It was generally in an out-of-the-way place, possessing no community benefits, and consequently men were averse to living there. He was of the opinion that central-station service would tend to improve this. He has seen power houses at mines in all conditions. The generating equipment is usually placed near the mine on account of cheap coal transportation, and the engine equipment is nearly always single-cylinder, non-condensing, a compound or condensing engine being a rarity. Future growth is provided for occasionally by leaving room for another engine. Further than this nothing is done. All temporary work done around a mine generally becomes permanent; no reports are kept, no indicators are owned or used, and a graphic record of the load on is an unknown quantity. It is no uncommon sight to find an engine running along with a piston ring broken into three or four pieces. A mine boiler house is usually synonomous with trouble, worry and insomnia. The feed-water heaters are usually too small, insufficient draft is provided and no tests are ever made. In fact, as long as the fires burn fairly well, water is forced in, some steam is got out and the walls stand up it is considered all right. Repairs are made only when necessary to keep things going. The transmission of energy is the most important item, Mr. Hopwood said, and many troubles are due to an inefficient transmission, particularly to excessive drop. Equipments designed for 250 volts often are working on 75 volts. Armature repairs are consequently excessive, the author having seen as

many as fifteen armatures taken from a mine at one time. This inefficiency in electrical operation reacts on all other forms of energy around the mine. It produces slow speed of haulage which reduces tonnage, causes breakdowns, delays operation of the mine, and the men operate at about 30 per cent efficiency. Central-station energy, while not by any means a panacea for these ills, will greatly alleviate them because of its many advantages. He suggested that, as pumps usually run only at night, an alternating-current motor might be used to drive them and to drive a direct-current generator in the daytime. The author objected to the inaccessibility of mine locomotives for purposes of repair.

Discussion

Mr. Bright in discussing Mr. Hopwood's paper said that the small mine often could not afford to pay for expert engineering service.

Mr. N. W. Stover suggested that the mines committee secure the adoption of standards for mines, especially regarding gages and heights of trolleys. Further discussion brought out the fact that central-station engineering service to be of real service must be based on actual knowledge of mine work. Many good engineers fail because they are not aware of the actual conditions for which they make recommendations. All apparatus used should be standard so as to facilitate repairs. Comparing a rotary and a motor-generator set, the former is more efficient by 10 per cent, but this should be based on 50 per cent load. If the former drops its voltage owing to drop in speed, etc., it loses that 10 per cent advantage. The motor-generator compounded from 250 volts to 275 volts has proved quite successful. Mr. Biesecker stated that the Delaware, Lackawanna & Western plant had 30,000 hp connected and twenty-five substations. Troubles there with low voltage were due mostly to a drop between substation and locomotive caused by poor bonding. To correct this the company has paralleled the track with steel rope, discarded from haulage use, and cross-bonded to the track with it. The company's experience with two three-wire stations had been very unsatisfactory. Wire in conduit is to be avoided in mine work, he said, as sulphur water attacks the pipe and honeycombs it. Likewise his experience with rotaries in the mines has not been good. The place for substations, in his estimation, is not in the mine. His company uses flat compounded machines.

Chairman Wood believes all mine people agree that substations should not be placed in the mine. He is also in favor of limiting the potential of circuits in mines to 300 volts.

MINING LOADS FOR CENTRAL STATIONS

Messrs. W. Sykes and G. Bright give in this paper a comprehensive outline both of the various applications of electricity in mine operation and the proper basis for fixing rates for such service. In general, the energy supply to a mine is used in haulage, hoisting, ventilation, coal-cutting, pumping, tipple or breaker operation, machine and blacksmith-shop drive, and lighting. As a rule, the haulage load is very ragged, as to both power-factor and load-factor, a great deal depending on the character of the converting apparatus used. A hoisting load is also apt to be very unsteady, the amount of variation depending on the nature and extent of the hoisting done. The ventilating load is such as to improve the load-factor and regulation but not the power-factor. While the load-factor of a single coal-cutting machine is low, where there are a number supplied the combined load-factor is fairly high. The pumping load greatly increases the total load-factor for the mine because of its even and continuous character. The load-factor is fair and the power-factor poor on tipple or breaker service. Both the machines and blacksmith shop drive and the lighting take so little of the total energy that they do not materially affect the combined load-factor or power-factor for the mine as a whole. A comparison is then drawn between the "flat rate," "maximum demand" and "combined flat rate and fixed charge" systems of determining rates and the advantages and disadvantages of each are explained. The methods of measurement for use with these different systems are touched upon and the effects of power-factor, load-factor and diversity-factor on the rates considered. The paper closes with suggestions as to the items to be included in a contract for supplying electric power for mining operations.

Discussion

Mr. Lincoln said the ideal rate should take into account load-factor, power-factor, quantity and time of peak, should be easily measured and, furthermore, easily explained to the customer. However, the best that can be done is to effect a compromise on the points over which differences occur. The rate should depend on the maximum demand plus kilowatt-hours consumed, and should also take into consideration the power-factor of the load.

Mr. Swann, who is connected with a plant having a rating of 40,000 kw, the output of which is used chiefly in mines, said he tried to secure an ideal rate for such service. For loads ranging from 0 kw to 300 kw the peak-load limitation is five minutes and the circuit-breaker is set at 100 per cent overload; from 300 kw to 500 kw the peak-load limitation is ten minutes and the circuit-breaker is set at 75 per cent overload; for loads over 500 kw the peak limitation is ten minutes and the circuit-breaker is set at 50 per cent overload. By this means practically all classes of service are covered. The speaker quoted several rates based on investment charges with the resulting diversity-factors. He also does not approve of underground substations, but advocates their relocation, which has been the policy of his company in securing mine business. Two locomotives, he said, with proper voltage, can do more work than three at ordinary mine voltage. His company uses one form of standard contract in which the base rate is $12 per kw, plus 1½ cent per kw-hr., subject to discounts in steps of 2½ per cent. This is equivalent to from 1.35 cents to 0.006 cent per kw-hr. on a consumption of from 10,000 kw-hr. to 30,000 kw-hr. His company is endeavoring to sell "service," believing the operators want reliable service and not cheap energy. The system is operating at 44,000 volts, and no effort has been made to correct for power-factor as yet.

Mr. Swann believed a mine load to be an alternating-current proposition, even though the mine be equipped with direct current. Mr. Bright said that where the name-plate rating is used to determine the fixed charge it places a burden on the operator in case the apparatus is not used up to its full-load rating.

Mr. S. B. Stover, of Syracuse, N. Y., who has made a particular study of the rate question, stated that he was glad central stations were getting down to a service plus a kilowatt-hour charge. The speaker advocated a sixty-second peak and said the only fair way to determine a peak is by its effect on the governor of the prime mover. This action varies with steam and water plants, the former being able to carry peak loads longer than the latter. The speaker advocated approaching a prospective customer with the following proposition, which he had used very successfully several times: The central-station company offers to put in the equipment for one year and operate it, and if at the end of that time the customer is not satisfied with the cost and with the operation the central station takes back the equipment, refunding to the customer the amount he paid for it at first.

Following the discussion, the Question Box was opened and several pertinent questions pertaining to the operation of coal mines were read by the chairman and either answered or referred by him to some member qualified to do so.

Interest of Minority Stockholders in Public Utilities to Be Established

A suit recently filed in the Superior Court of Cook County, Illinois, is of unusual interest because it strikes at the fundamental relationships between the parent Bell Telephone Company and its subsidiaries which our readers will recall have been the subject of recent investigations by the federal Department of Justice. This department turned over its findings to the Interstate Commerce Commission, which, it is understood, will conduct a complete investigation on its own account. The present suit is one in equity against the Central Union Telephone Company, the Chicago Telephone Company, the American Telephone & Telegraph Company and certain individuals, William A. Read, Charles J. Spencer and Charles G. Foster, as complainants, the latter being stockholders of the Central Union Telephone Company and holding a minority interest therein. The bill of complaint asked for an injunction against the Central Union Telephone Company and the appointment of a receiver, on the basis of certain allegations set forth in much detail in the complaint. The immediate cause of this action on the part of the complainants was the alleged intention of the board of directors and the officers of the Central Union Telephone Company to dismember the property of that company, which is situated in the States of Ohio, Indiana and Illinois, and dispose of the plant in return for certain outstanding 6 per cent demand notes held by the American Telephone & Telegraph Company and the Central Union Company, amounting to $32,000,000.

It is set forth in the complaint that the Central Union Company was one of the original subsidiaries of the Bell system and was organized in 1883 to do business in Ohio, Indiana and Illinois, with the exception of certain counties, which included among other places the cities of Chicago, Cleveland and Cincinnati. The parent company, it is alleged, also withheld the right to transact the toll and long-distance business between points within the territory situated more than 100 miles apart. The total outstanding capital stock of the Central Union Company is now $5,450,-927, and it is charged that with the exception of about 2000 shares the entire capital stock is owned or controlled by the parent or American Telephone & Telegraph Company. The three individual complainants set forth that they collectively own 829 shares of the stock, which represented an original investment on their part of about $91,000. The bill of complaint took up at considerable length the contractual relations between the parent Bell company and its subsidiaries, including the agreement of 1902, under which the Central Union Company paid to the American Telephone & Telegraph Company 4½ per cent of its gross revenues to cover the rental of transmitters and receivers and the general right to do business under the patents owned or controlled by the parent company.

Since about 1896 the Central Union Company has paid no dividends on its capital stock, and the outstanding amount of the latter has not been increased. Subsequently bonds were issued to the amount of $6,000,000, and other financing was effected from time to time by loans from the parent Bell company, in return for which the Central Union Company gave its 6 per cent demand notes, and which now amount to some $32,000,000, about $10,000,000 of which is held by the Chicago Telephone Company, with the balance in the hands of the parent company. The bond issues were recently re-funded although they had not reached maturity.

The complainants charged that it was the purpose of the officers of the Central Union Company early during the present year to sell the tangible assets of the company in the State of Illinois, including franchise rights and good will, to the Chicago Telephone Company for the sum of about $8,900,000, or substantially the amount at which the physical plant in Illinois is carried on the company's books. This procedure, the complainants argue, would defraud them of any returns on their stock, and they charge in general that the management of the Central Union Company has at all times been under the complete domination and influence of the parent Bell company and that the result has prevented the minority stockholders from participating in their just share of the company's profits. It is also charged that the commissions allowed the Central Union Company on originating long-distance business and the arrangements for prorating long-distance tolls on messages handled over joint lines have been inadequate and unfair to the Central Union Company. Furthermore, it is alleged that because of the control exercised by the parent Bell company the Central Union Company has been prevented from handling much of the long-distance business which originates and terminates within its own territory and has been unable to make contracts with the parent company on terms as advantageous as would be the case if such control had not been exercised. The individual defendants named in the bill include Mr. B. E. Sunny, president of the Central group of Bell subsidiary companies and a vice-president of the American Telephone & Telegraph Company; Mr. T. N. Vail, president of the American Telephone & Telegraph Company; Mr. U. N. Bethell, vice-president of the American Telephone & Telegraph Company, and Messrs. L. C. Richardson, A. Burt, C. E. Mosley, B. S. Garvey, H. F. Hill, J. Sherwin, C. H. Brownell, E. E. Jackson, L. N. Whitney and W. I. Mizner, directors or officers of the Central group of Bell companies.

The defendants in their answer denied that the parent Bell company had ever exercised any improper control or influence over the Central Union Company and alleged that the contractual relations between the two companies were in all cases fair and equitable. They also stated that during the early period of development, when the Central Union Company was embarking in the exchange business, it was necessary for the parent company to retain the right to handle long-distance messages and to build and operate the plant therefor, because the local company was unskilled in the long-distance art and, generally speaking, incompetent to engage in that branch of the business, which was regarded as presenting great difficulties and obstacles. The answer also specifies that the parent company renders various engineering, legal and other services to the subsidiary companies, which much more than compensate for the 4½ per cent of the gross revenues of the subsidiary companies which is exacted as royalty.

Public Service Commission News

Indiana Commission

Governor Ralston of Indiana has named three members of the Public Service Commission of Indiana, which began its duties on May 1. Mr. Thomas Duncan, Princeton, and Mr. James L. Clark, Danville, have been appointed to serve four years, and Mr. Charles J. Murphy, Brookston, has been appointed to serve for two years. Messrs. John F. McClure, Anderson, and Frank E. Payne, Jeffersonville, the two members of the Railroad Commission of Indiana whose terms have not expired, are continued in office under the utility commission act. Mr. Burt New will be the general counsel of the commission and will serve as legal adviser of both the Governor and the commission. Mr. Duncan will be the chairman of the commission.

Missouri Commission

Governor Major of Missouri has announced the appointment of Mr. John M. Atkinson, former assistant attorney general; Mr. John Kennish, former Supreme Court judge; Mr. H. B. Shaw, dean of the engineering department of the Missouri State University, and Mr. Frank A. Wight-

man, of the Missouri Railroad Commission, as members of the Public Service Commission created by the recent Assembly. Mr. Wightman's term will expire on April 15, 1915. Mr. Shaw and Mr. Kennish are to serve four years. Mr. Atkinson is to serve for six years. This leaves one member still to be appointed. Mr. Atkinson has been elected chairman of the commission. A question having arisen in regard to the present status of the Public Service Commission of St. Louis, City Counselor William E. Baird of that city reported to the Municipal Assembly in part as follows: "The local body may continue to make investigation concerning matters connected with franchises of public utilities and violations of them in order that the best interests of the city may be protected by the proper authorities; to investigate methods of operation, facilities furnished and quality of service given, in order that the Assembly may, if it sees fit, cause the matter to be brought before the State Commission, or in order to afford the results of its investigation to the public who may desire to take such action, and to furnish information to the Municipal Assembly concerning the granting of its consent for the operation of a street railroad or the execution of contracts between the city and the public utilities companies. I am of the opinion that the city has the power to continue the commission for these purposes."

New York Commissions

The New York Public Service Commission for the First District has issued an order requiring all public-service corporations to adopt certain safety appliances and to take certain precautionary measures to protect their employees against injury by contact with conductors charged with electricity. The order covers twenty-eight different points.

The Public Service Commissions have assumed jurisdiction of baggage and transfer companies. The new law places under the jurisdiction of the commissions all baggage and transfer companies which are operated wholly or in part upon or in connection with a railroad or a street railroad. It gives to the commissions jurisdiction over such companies to the same extent as is now had over railroad corporations and street-railroad corporations in matters pertaining to rates, service and capitalization. The same provision made in relation to the liability for loss, damage or injury to property in transit which has existed in relation to railroads is now applicable to baggage and transfer companies.

Maryland Commission

The Maryland Public Service Commission has decided that the Consolidated Gas, Electric Light & Power Company of Baltimore cannot be compelled to furnish alternating-current or direct-current service at the option of the consumer. A manufacturing concern sought to have the commission compel the electric-light company to supply alternating current which it desires to use in an electrical welding process. The Consolidated company refused on the ground that the factory is in the territory supplied with direct current and that it would prove too expensive to run a special line from its power station. It asserted that the direct current could be converted into alternating current by the use of a motor-generator which the consumer could supply. The cost of running a special wire to the factory would be $604 and the duct rental would be $48 a year, while the return to the company would be about $37 a month.

Washington Commission

The Public Service Commission of Washington recently decided against the contention of Puget Sound Traction Light & Power Company of Seattle that it be permitted to put into effect without the usual thirty days' notice a rate intended to touch only those who would guarantee a minimum of business amounting to $10,000 and sign a ten-year contract.

Massachusetts Commission

An appeal has been presented to the Gas and Electric Light Commission by the Ludlow Manufacturing Company, of Ludlow, against a franchise granted by the Selectmen of the town to the Warren Power Company authorizing the latter to erect lines for the transmission of electrical energy within the municipality at pressures not exceeding 110,000 volts and to install distributing lines, provided that by Nov. 25, 1914, the company is ready to deliver 1000 hp for sale within the town. By Chapter 200, Acts of 1899, the Ludlow company was authorized to manufacture and sell electricity for lighting and other purposes in the municipality, and it has engaged in this service since.

New Jersey Commission

Governor Fielder has signed the House bill giving the Board of Public Utility Commissioners authority to direct street railways to place tracks, wires and appurtenances on certain public bridges when there is a dispute as to the right-of-way between the railway company and the municipalities. He has also signed the bill increasing the annual appropriation of the Board of Public Utility Commissioners from $100,000 to $200,000, and has vetoed the bill giving the Board of Public Utility Commissioners power to authorize electric railways to operate freight cars through municipalities which object to the operation of such cars.

Current News Notes

Warship Offer to Colleges Withdrawn.—Secretary of the Navy Josephus Daniels has withdrawn the offer of warships for the use of college students during the summer months which was reported in the *Electrical World* on page 562 in the March 15 issue. Sending the fleet through the Mediterranean will make it necessary to use some of the ships now in reserve for various details. Consequently none will be left available for the use of college men.

* * *

Chicago Papers for Prize Competition.—A committee of the Commonwealth Edison Company Section of the National Electric Light Association, of which Mr. E. F. Smith, past-chairman, was president, has reported on the papers read before the section since the Seattle convention to be entered for the competition for the Doherty and Harriet Billings medals. The papers selected are by Mr. W. L. Abbott, on the Northwest Station of the Commonwealth Edison Company, Chicago; Mr. W. J. Norton, on electric rate making, and Mr. A. D. Bailey, on human engineering.

* * *

Educational Endeavors of the Baltimore Section, N. E. L. A.—In order to maintain a lively interest in the section work and to secure a full attendance throughout the winter, the Baltimore Section of the N. E. L. A. has devoted much time during the past few months to educational department group meetings. The monthly program has been as follows: On the first Tuesday of each month the entire membership has been addressed by Dr. J. B. Whitehead, professor of applied electricity, Johns Hopkins University, who has presented this subject in an elementary way. On the second Tuesday evening of the month meetings have been held in the distribution laboratory of the company for the purpose of permitting the membership to have the benefit of experimental work in connection with the subject covered by Professor Whitehead on the previous meeting night. On the third Tuesday a prearranged department group meeting schedule has been strictly adhered to, embracing groups of men of the various departments. On the fourth Tuesday of each month the general meeting of the company's section is held.

Mayor Harrison on Chicago Traction.—In his annual message to the City Council of Chicago, presented on April 28, Mayor Harrison criticised existing local transportation systems and urged a referendum on two traction plans—one authorizing a comprehensive system of independent subways and the other a merger of existing elevated and surface lines.

* * *

Local Control of Utilities in Chicago.—One of the pending measures relating to public-service commissions in Illinois is known as the Glackin bill. It directs that the Mayor of Chicago appoint a commission to control public utilities in that city. The City Council of Chicago, however, has decided by a vote of 28 to 23 to oppose any bill which would decrease its powers. Mayor Harrison in his annual message spoke approvingly of the Glackin bill.

* * *

Advanced Telephone Engineering Course at Lewis Institute.—Mr. Arthur Bessey Smith, formerly professor of telephone engineering at Purdue University, will give a course of lectures on advanced telephone engineering at Lewis Institute, Chicago, beginning June 6, 1913. A laboratory course will be given in parallel with the lectures, which will be delivered on Monday and Wednesday evenings. The course includes twenty lectures, the title of the first one being "The Problems of the Telephone." The principal features of telephone engineering will be discussed in this course of lectures.

* * *

"Nickel-First" Telephone Service Preferred to "Nickel-Last."—Following instructions from an aldermanic committee investigating telephone rates, City Electrician Palmer's assistants asked 521 subscribers to the nickel-first service of the Chicago Telephone Company if they were satisfied with that service. Of this number 347 were satisfied and 174 preferred the "nickel-last" method. By the former system it is necessary to drop a nickel or slug into the coin box before establishing communication with "Central" unless some push-button or other method of calling is provided to be used in emergency.

* * *

Examination for Hydroelectrical Engineer.—An open competitive examination for hydroelectrical engineer will be held soon by the United States Civil Service Commission to fill vacancies in the Forest Service, Department of Agriculture, and the Reclamation Service, Department of the Interior. Applicants must be between twenty-five and forty-five years of age and should be qualified to conduct expert examinations of water-power sites, possess theoretical and practical knowledge of hydrology and river hydraulics and also be thoroughly familiar with the design and operation of hydroelectric plants and have had special experience in testing, installing and operating them for supplying energy and for industrial service and irrigation pumping. The salaries range from $1,800 to $2,400 per annum. Full information regarding this examination may be had by applying for Form 304 of the United States Civil Service Commission, Washington, D. C., prior to May 19, 1913.

* * *

SOCIETY MEETINGS

Rejuvenation in Waterloo.—A dignified rejuvenation of the Jovian Order was held in the Knights of Pythias Building, Waterloo, Ia., on the evening of April 24, during the convention of the Iowa Electrical Association and the Iowa Street and Interurban Railway Association. Forty candidates were initiated into the order, including a number of well-known public-utility operators. Mr. N. W. Lovegrove, of Des Moines, statesman for Iowa, was in charge of the initiation. He was assisted by a number of Chicago Jovians, including Mr. Sam A. Hobson, past-Jupiter, who presided. A buffet supper was served after the ceremony.

Railway Electrical Engineers' Convention.—The Association of Railway Electrical Engineers will hold its annual convention in the Hotel La Salle, Chicago, from Oct. 20 to Oct. 24, 1913. Mr. W. J. Cartwright, of the Lehigh Valley Railroad Company, is president of the association, and Mr. J. A. Andreucetti, of the Chicago & Northwestern Railway Company, Chicago, is secretary. During the convention the Railway Electric Supply Manufacturers' Association, will give its annual exhibition. Mr. G. H. Atkins, of the Electric Storage Battery Company, is president of this association, and Mr. J. Scribner, of the General Electric Company, Chicago, is secretary.

* * *

Freight Handling at Boston Terminals.—At a joint meeting of the Boston Society of Civil Engineers and the Boston branches of the American Institute of Electrical Engineers and the American Society of Mechanical Engineers on April 25 a paper on the delivery and handling of freight at the Boston terminals was presented by Messrs. Harold Pender, H. F. Thomson and C. P. Eldred, of the Massachusetts Institute of Technology. The paper, which will shortly be published by the Massachusetts Institute, contains an exhaustive account of the methods of analyzing terminal operating conditions at Boston, with load curves, diagrams and data indicating the best methods of eliminating delays, recent improvements and the detailed distribution of time in the various steps between the arrival of freight and the racking of the bills.

* * *

Joint Meeting of Engineers in Chicago.—A joint meeting of the Chicago Section of the American Institute of Electrical Engineers and the Electrical Section of the Western Society of Engineers was held in Chicago on April 28. Officers for the Chicago Section of the Institute were elected as follows: Chairman, Mr. D. W. Roper; secretary, Mr. E. W. Allen; member of executive committee, Mr. R. H. Rice. The old members of the executive committee are Messrs. J. G. Wray and W. B. Jackson. Dr. W. F. M. Goss, of the University of Illinois, president of the American Society of Mechanical Engineers, presided at the meeting. The principal speaker was Mr. R. D. Mershon, president of the American Institute of Electrical Engineers. Mr. Mershon spoke of the desirability of close co-operation between national engineering societies and mentioned the proposed licensing of engineers in New York State as a subject considered by a committee representing several of the societies. He said that the engineer has not taken that part in civic affairs which he should, and he urged reform in the United States patent system and the appointment of a non-political patent commission to study the subject. Mr. A. Reichmann, president of the Western Society of Engineers; Mr. Paul M. Chamberlain, chairman of the new Chicago Section of the American Society of Mechanical Engineers; Mr. Albert Scheible, Mr. Stafford Montgomery, Mr. P. Junkersfeld, Prof. W. C. Bauer of Northwestern University, Messrs. D. W. Roper, R. F. Schuchardt, A. Bement, W. B. Jackson and Prof. P. B. Woodworth of Lewis Institute took part in the discussion. Mr. Scheible remarked that the Electric Club of Chicago had appointed a committee to work toward securing quarters as a common Chicago center for engineering and electrical societies. He also said a good word for the American patent system. Mr. Junkersfeld made the interesting statement that 49 per cent of the people of Illinois get their living from industries connected with engineering, and Mr. Roper cited the work of the electrolysis committee of the utilities in Chicago as an example of engineering co-operation. The next joint meeting will be held on May 26, at which time it is expected that Mr. H. E. Chubbuck, vice-president executive of the Illinois Traction System, will speak.

Electrical Equipment of a Modern Hotel

Artistic and efficient lighting scheme in the McAlpin Hotel, New York—System of control of electric circuits to insure continuity of service

THE McAlpin Hotel, at Thirty-fourth Street and Broadway, New York, which was recently opened to the public, represents in an excellent way the most modern developments in all the details of equipment which contribute toward the increased comfort and pleasure of hotel patrons. Skill and foresight on the part of the architects and engineers resulted in the extensive use of electricity throughout this new hostelry. From a private plant energy is furnished for lighting, for the operation of a forced ventilating system, for laundry and refrigerating purposes, for escalators and dumb-waiters and for numerous other purposes, particularly in the kitchens, where no fewer than twenty-five motors are installed for various uses.

The building is of fireproof construction, rising twenty-four stories above the ground, with four stories below the sidewalk level. The sub-basements contain the boiler, engine, refrigerating, pump and fan rooms, laundries, engineers' and electricians' offices, general storage, etc. The rathskeller, barber shop, general toilets, kitchens, florist shop, etc., are located in the basement. On the first floor are stores along the Broadway, Thirty-third and Thirty-fourth Street sides, the main lobby, general offices, cigar, news and telegraph stands and public telephone station.

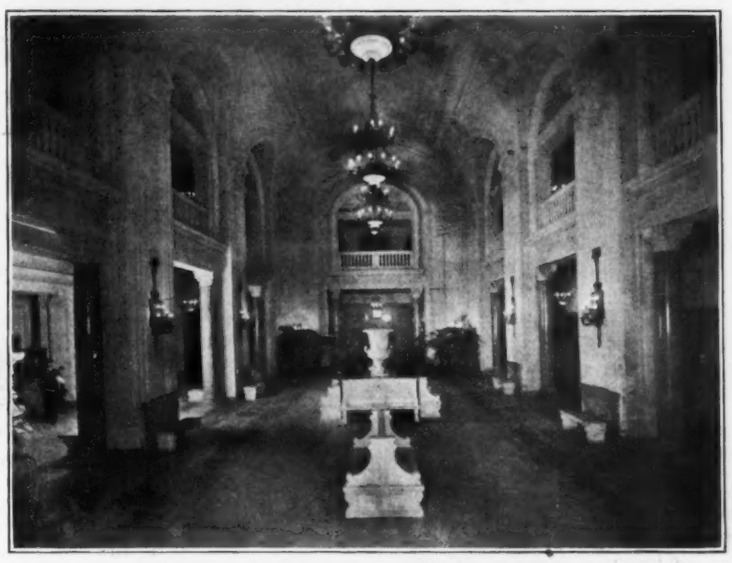


FIG. 1—LOBBY OF THE M'ALPIN HOTEL

The first mezzanine floor contains the main dining room, banquet hall, ladies' café, parlors and writing room. On the second mezzanine floor are the gentlemen's lounge, private dining rooms and executive offices. The floors from the third to the twenty-second inclusive are arranged with sleeping rooms, baths and suites. The twenty-third floor contains the main telephone switchboard room, roof-garden kitchen, valets' department, silver-plating department, upholstery shop and servants' quarters. The ballroom, Turkish bath and roof garden are on the twenty-fourth floor.

Boiler and Engine Rooms

There are installed six 394-hp Babcock & Wilcox wrought-steel vertical-header longitudinal-drum boilers constructed for a working pressure of 200 lb. per sq. in. The heating surface of each boiler consists of two steam and water drums 42 in. in diameter and 20 ft. 4 in. long, placed above and connected to a set of sixteen sections of tubes, each section consisting of twelve tubes 4 in. in diameter and 18 ft. long. The lower ends of the sections are connected to a mud drum. Each boiler is equipped with a Webster furnace and 97 sq. ft. of Dean grates. All pipings and fittings are of polished brass. Each boiler is set singly, the front of the setting being faced with white enamel brick and all walls coped with bluestone. A system of narrow-gage tracks is provided for the haulage of coal and ashes. A coal-weighing machine dumping 300 lb. of No. 1 buckwheat is also installed. For the feed of the boilers there are three Simplex 12-in. by 8-in. by 12-in. American outside-packed steam pumps, and in connection with the return drips and blow-off tank there are two American 6-in. by 4-in. by 12-in. pumps. For the purpose of consuming the garbage a special destructor was designed by the Morse-Boulger Company, New York, having a capacity for disposing of 4 tons of garbage per day.

The engines are of the Wetherill Corliss type. Three units are rated at 300 kw and one at 200 kw. They are directly connected to 240-volt compound-wound, three-wire Crocker-Wheeler generators. These are so placed that one is at right angles to the other three.

Switchboards

Owing to the comparatively cramped space conditions caused by the use of hydraulic elevators instead of electric ones, as originally planned, it was necessary to arrange the main switchboard in three sections. The generator panels are on the engine-room-floor level, the main feeder distribution switchboard on a balcony, and the feeder switchboard for the house lighting is on the third mezzanine floor. All the boards are built of gray Tennessee marble and are of ample size. There is no undue crowding of switches or instruments on the front of the boards, and on the rear there is plenty of clearance for busbar work. Each generator is connected through a generator control panel and one of two sets of main busbars to the main selector switches on the main distribution board. These switches are connected through the main busbars to the circuit-breakers and distribution switches. The four generator panels are set in a compartment and are grouped in pairs so as to be located directly in line with the flywheels of the engines. In the center of each board is a panel containing two watt-hour meters. On the top section of each generator panel are mounted a five-pole, two-coil overload and a reverse-current motor-operated circuit-breaker, with auxiliary switches for operating the breakers from the benchboard. The generator cables are so con-

nected to the top studs of these breakers that the current passes through the breakers to the bottom studs and through busbars to the hinge studs of a five-pole double-throw fuseless switch mounted on the bottom section of this panel. By closing this switch to the right the connection is made to the No. 1 set of main busbars, and by

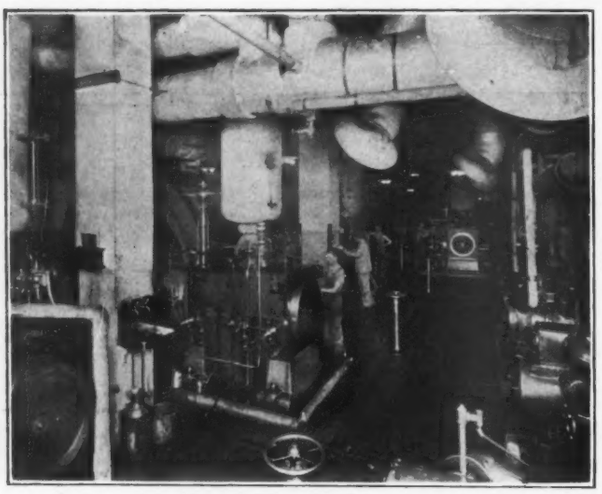


FIG. 2—VIEW OF ENGINE ROOM

closing it to the left the No. 2 set of main busbars is thrown in. Use is made of auxiliary switches for operating lamp signals on the benchboard to show to which busbars the switches are connected.

The generator rheostats are mounted under the switchboard gallery and are furnished with motors so that they can also be electrically operated from the benchboard. While each generator can be connected or disconnected manually, by walking from one generator panel to another, past the engine flywheels or around the engines and generators, the operator can also control all of the generators from the benchboard. This board is constructed in the form of a tilted table with the sides inclosed. All control instruments are mounted on the top so that the operator can see all parts of the engine room and at the same time

FIG. 3—MAIN DINING ROOM

see the voltmeters, ammeters and signals of all generators. With this benchboard there is perfect remote control of the entire plant.

In the engineer's office there is an instrument board which contains the following Esterline graphic instruments: One three-wire ammeter, connected to shunts on the main lighting buses on the main distribution board, which records the total lighting current used; one graphic time-service instrument, connected back to the generator side of the circuit-breakers, showing how long each generator is connected in on the main busbars; one two-wire graphic ammeter connected to give the total motor load on the main distribution board; one two-wire graphic voltmeter to give the voltage on the motor-service busbars; two two-wire 110-volt graphic voltmeters to give the voltage on either side of the neutral on the three-wire 110-220-volt lighting bus. This gives the operating engineer a check on the variations in voltage, the loads carried at various times of the day and the hour each generator is in service. It also affords a method of studying the load conditions imposed on the plant.

The main distributing board is mounted on the gallery near the benchboard. All circuit-breakers and switches have extension studs extending back to guide or fuse panels and extension copper buses from this point to lugs at the top of the board, within a short distance of the pull box over the entire top of the board, in this way doing away with the necessity of exposing the cables.

The house distribution board contains twenty-four 200-amp three-pole, double-throw feeder switches for the lighting of the upper floors. The double-throw switch is so

FIG 4—ELECTRICALLY EQUIPPED LAUNDRY

arranged that by having the blades in one position current passes directly to the feeder, while by throwing the blades in the opposite direction the current passes through an Esterline three-wire graphic ammeter for testing load conditions in any one of the twenty-four sections of the house. For the proper control of the lighting, independent feeders have been extended from the switchboard to the various specially detailed rooms, such as the main dining room, rathskeller, ladies' café, etc. For the upper, or sleeping, portions of the house each feeder system is arranged for the control of not more than five panels, the building being divided into wiring zones so as to reduce the number of circuits on the panel to a minimum.

Lighting Equipment

In the lower portions of the house—that is, in the kitchen, wine bins, laundries, etc.—the fixtures are of either the single pendent or the wireless-cluster type, and in all cases shades of the enameled-steel type have been provided, in order to minimize the cost of maintenance. In the barber shop use is made of ceiling fixtures, each consisting of a specially designed indirect fixture, with brackets of simple design, over the mirrors, the light in this room being unusually soft and effective. The same scheme of lighting is carried out in the washroom, toilets and bootblacking

department. The lighting for the special rooms in most cases has been treated to conform with the architectural character of the room. The rathskeller presented a difficult problem in illumination, owing to the peculiar texture of the material used in its construction and the bright colors used to carry out the effect. The original plan of this room contemplated the use of hanging lanterns, but after some study reflectors behind glass panels and dishes were adopted. The brackets were, however, finished before the new scheme of lighting was adopted, and rather than have this part of the equipment a total loss, it was decided to install the brackets also. In the ladies' café hand-painted porcelain has been used to add to the effectiveness of the ceiling fixtures and brackets, and reflectors have been installed in the cornice around the room to provide special illumination for the panels near the ceiling.

All floors above the second up to and including the twenty-second floor are used exclusively for sleeping purposes. The lamps used for corridor lighting are so wired as to provide an alternate system of lighting, thus enabling the house staff to put either half or all of the lamps in the corridors in service. Exit fixtures have been installed over the doors leading to all stairs, and these are equipped with ruby-colored globes. For the stair lighting there are two lines of bracket fixtures, the wiring for which has been

FIG. 5—MEN'S LOUNGE

so arranged as to make it almost impossible to be without light in the event of the blowing of a fuse. The bedrooms are equipped with specially designed ceiling dishes, brackets alongside the bureaus, portable desk lamp and portable lamp on the somnoe stand and a lantern in the entrance vestibule to each room. Each bathroom is illuminated by a ceiling lantern and a specially designed bracket fixture over the medicine cabinet. In some of the bedrooms where it was found impracticable to install two brackets alongside the bureaus a specially designed ceiling fixture has been installed.

The lighting of the central portion of the ballroom on the twenty-fourth floor is accomplished by specially designed reflectors placed in a cove around the room, each side of the room also being lighted by ceiling fixtures. The stage is equipped with footlamps arranged on two circuits controlled from the panels by dimmers. These dimmers can also be arranged to control the lighting in the main body of the room upon special occasions.

The lighting of the building is planned so that each of the large rooms is controlled by special feeders and individual panels. The lighting of the typical bedroom floors is divided into zones, with a panel for each zone, the wiring being so arranged that the ceiling outlets in the bedroom are on one circuit and the brackets and baseboard receptacles on another. Double-pole switches of the Manhattan detachable flush push-button type are used throughout the building for the control of the lighting fixtures. In order to provide for electric-heating apparatus of the portable type, the switches for controlling the ceiling lighting of the bathrooms are of the double, flush push-button type, in combination with which is a plug and receptacle. The

FIG. 6—TYPICAL BEDROOM

combination plug and receptacle was manufactured by the Manhattan Electric Company.

The exterior illumination of the building is provided for by four special brackets in front of the men's café on the Broadway side, four special standards at the second floor on the Broadway side and top and bottom lighting for the Thirty-third and Thirty-fourth Street marquises. The lighting scheme of these marquises has been made quite effective by the use of special glassware furnished by the Jefferson Glass Company.

MISCELLANEOUS ELECTRICAL APPARATUS

The laundry is equipped electrically throughout. Connections are provided for a large number of electric irons. The motor equipment is shown in the accompanying table.

For refrigeration purposes there are provided two 15-hp

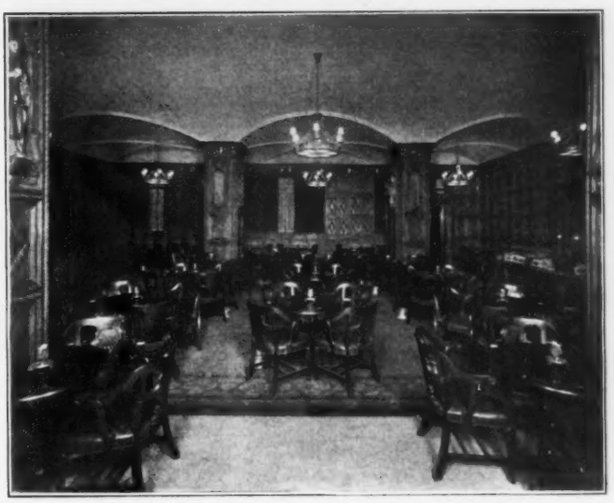


FIG. 7—MEN'S CAFÉ

motors operating brine pumps. There are two 65-ton vertical single-acting refrigerating machines and one 15-ton freezing tank operating on the so-called "improved flooded system," all made by the York Manufacturing Company.

Other electrically driven auxiliaries are the pneumatic-tube system, which is operated on the compressed-air prin

ciple; the vacuum-cleaner system, consisting of two eight-sweeper plants installed by the Vacuum Cleaner Construction Company, New York, and fans for hot-blast heating and mechanical ventilation, furnished by the Buffalo Forge Company.

An unusually extensive signal and telephone system has been installed in the hotel. For fire-alarm use there are the usual break-the-glass stations throughout the building and also ordinary watchman's stations. A special signal system is arranged in connection with these stations, connections being made to an annunciator in the telephone room which indicates the routing of the watchmen and enables the telephone supervisor to locate one of them at any time. At the entrance of each room or suite there is

MOTOR EQUIPMENT OF M'ALPIN HOTEL

Number of Motors	Machines	Motor, Hp.
Main laundry:		
10	42-in. by 64-in. washers	2
1	Panel control	1/5
5	32-in. extractors	1/4
1	Steam-drying tumbler	5
1	Two-section cabinet dry room	1
1	Five-roll flat-work ironer	3
2	Six-roll flat-work ironer	3
Guests' Laundry:		
2	37-in. by 54-in. washers	2
1	26-in. extractor	3
1	Shirt starcher	1/4
1	14-in. starcher	1/2
1	Cabinet dry room	1
1	Conveyor dry room	2
1	36-in. body ironer	1/3
1	Bosom press	1/3
1	Air pump	1/2
1	24-in. ironer	1
1	Shaping table	1/2
Help's Laundry:		
1	Cabinet dry room	1/2
KITCHEN EQUIPMENT:		
Sub-basement:		
1	Ice crusher	1
1	Ice cuber	3
Help's kitchen:		
2	Vegetable peelers	3/4
1	Dish-washing machine	2
1	Meat chopper	2
Main kitchen:		
1	Coffee mill	1
1	Butter worker	1 1/2
1	Horseradish grater	1
1	Dough mixer	2
1	Vienna ice-cream freezer	1 1/2
1	Brine ice-cream freezer	2
1	Almond crusher	1 1/2
3	Whipping machines	1
1	Meat chopper	2
2	Dish-washing machines	3
1	Silver buffer	2
1	Dust collector	1/4
1	Knife cleaner	1/2
Officers' kitchen, third floor:		
1	Dish washer	1
Twenty-third floor kitchen:		
1	Dish washer	2
Twenty-fourth floor:		
1	Dish washer	1
1	Knife cleaner	1/2

a maid's signal, the annunciator being located in the main telephone room under the control of the telephone supervisor. A large number of telautographs are in use for various purposes.

There are at present in use in the hotel nearly 1700 telephone stations, which is said to be as many as are in service in the kingdom of Greece. To connect the stations to the switchboard it was necessary to install cables and wires with an aggregate length of conductors of about 600 miles.

The building and all its mechanical and electrical details were designed by F. M. Andrews & Company, New York, under the immediate supervision of Mr. Newton L. Schloss, superintendent of the company. The electrical installations of the hotel were made by the Thompson-Starrett Company, New York.

Hydroelectric Development on the White River

At the convention of the Missouri Electric Association, held at Kansas City, Mo., on April 17, 18 and 19, as noted in our last week's issue, a paper on "Hydroelectric Development of White River" was presented by Mr. T. O. Kennedy, of the White River Construction Company. Following is an abstract of Mr. Kennedy's paper:

Up to the present there is only one power plant on the White River, but this does not mean that all the available power of this stream is being utilized. The river flows for several hundred miles through Missouri and Arkansas, with an average fall of about 2 ft. per mile. The present development is being carried out by Henry L. Doherty & Company, who became interested late in 1911, the parties owning the site of the proposed dam and power house previously having made some preliminary surveys and stream-flow gagings.

The principal market for electrical energy is the Empire mining district, near Joplin, where the several plants of the Empire District Electric Company supply the necessary auxiliary service to enable the maximum output to be contracted for.

When construction work was started on the dam and power house it was necessary to establish a camp of sufficient size to accommodate a large number of men, as the

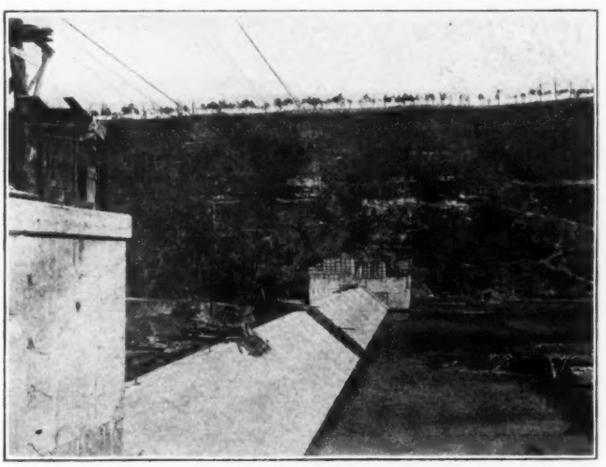


FIG. 1—UPSTREAM SIDE OF DAM—WORK NEARING COMPLETION

site is 7 miles from the railroad. Considerable attention was paid to this matter of camp, and as a result there have been absolutely no labor troubles. Living conditions in the camp, said the speaker, are more healthful, more pleasant and cheaper than in any other town in the county, and during the greater part of the time there has been a larger population of men, women and children than in any other town in Taney County.

The dam is of the familiar Ambursen type, consisting of a thin reinforced concrete deck plate supported at an angle of approximately 45 deg. from the vertical by means of concrete buttresses or piers seated on solid rock and spaced 18 ft. apart throughout the length of the dam. The center line of the dam runs east and west. On the east side of the river a vertical cliff rises about 200 ft. On the west side the ground is more rolling but rises to an elevation 75 ft. above the riverbed in about 1200 ft. from the cliff on the east side.

The power house, being 200 ft. long, extends well into the east bank and reaches to the middle of the old river channel. Provision is made for eight main units and two exciter units.

On account of the sudden high rises for which White River is noted it was decided to provide 600 ft. of spillway, although the width of the natural channel at the site was only one-half that figure. The spillway terminates on the

west bank in a cellular concrete abutment rising from solid rock to a height 25 ft. above the crest of the spillway. From this abutment there was built 400 ft. of earth embankment, with a concrete core wall extending to high ground to prevent flood waters from getting around the end of the dam.

Seventy thousand cubic yards of earth and 20,000 cu. yd. of rock were excavated by means of "clam-shell" and "orange-peel" grab buckets operated by cableways and derricks. Some of the excavated earth was placed in the embankment, but most of it was sluiced into the river and wasted.

Each of the nine wheel chambers in the power house is provided with steel headgates operated either by hand or motor. In each of the headgates two small filler gates are provided to equalize the pressure and overcome friction when the gates are being raised.

At this time only five of the main units will be installed. Each waterwheel unit consists of a pair of 52-in. Smith turbines mounted on a horizontal shaft and set in a closed concrete flume. The draft tube is made of plate steel and measures 14 ft. in diameter at the bottom and is 18 ft. long.

These units will operate at working heads from 40 ft. to 54 ft. The output will vary from 2600 hp to 4000 hp, the mean effective head of 50 ft. developing 3600 hp.

Two exciter units are being installed, each being driven by an 18-in. Smith turbine developing 200 hp at a net working head of 50 ft. The speed of each unit is controlled by an individual Lombard governor.

A 2250-kva generator is mounted on the same shaft with each waterwheel generating three-phase, 25-cycle alternating current at 2300 volts. The speed of these units is 214 r.p.m. The direct-current exciter units, rated at 175 kw and 125 volts at 600 r.p.m., are also directly connected to the wheels.

The transformer equipment will ultimately consist of three banks or nine transformers. Two banks and one spare unit are now being installed. These 2000-kva transformers step up the emf to 660 volts, which is the transmission voltage.

The switchboard will be erected on the transformer balcony overlooking the generator pit. All high-tension wiring is on the third floor, where electrically operated oil switches will control the outgoing line. The power-house equipment will be protected by the usual choke coils and electrolytic lightning arresters, which will also be located on the high-tension floor.

To handle the heavy apparatus from the railroad to the power house two 30-ton barges were built. A stiff-leg derrick at Branson enables the machinery to be transferred

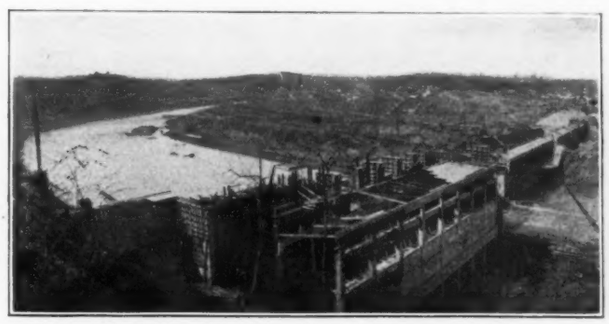


FIG. 2—POWER HOUSE AND DOWNSTREAM FACE OF DAM

from cars to boats and a similar derrick at the power house places the load under the traveling crane. The heaviest pieces to handle are the generator rotors, which weigh 22 tons.

The present transmission system comprises 150 miles of line. The first 20 miles is carried on steel towers across very rough country to Ozark, Mo. The remainder of the line is carried on wooden poles and follows county highways to Springfield, a distance of 30 miles, and thence to Joplin, a distance of 100 miles.

In the steel-tower line the supports are spaced on an average 450 ft. apart. The regular line structure is a flexible A-frame tower with one anchor or square tower per mile of line. The longest span in this section of the

FIG. 3—WHITE RIVER WITH WATER ABOVE THE SPILLWAY

line is 1000 ft. The line consists of three No. 00 bare, stranded, hard-drawn copper conductors, two 5/16-in. Siemens-Martin galvanized ground wires and four No. 8 B. & S. gage copper-clad telephone wires. Pin-type insulators are used throughout. Switch towers are so installed that the line can be divided into 7-mile sections for locating and repairing breakdowns.

In the wooden-pole line the supports are spaced 150 ft. apart. White cedar poles are used except for corners and switch points, where square steel towers are installed. Pin-type insulators are used, except for dead ends, where suspension type are substituted. Between Ozark and Springfield the equipment of the line is the same as that of the steel-tower line except that the telephone circuits are No. 10 hard-drawn copper. Between Springfield and Joplin the conductors are No. 0 bare, solid, hard-drawn copper.

To prevent interference on telephone lines from the high-tension current the telephone circuits are transposed at every span on the tower line and at every second span on the pole line. The ground wires on the pole line are run to earth at every second span.

The Springfield substation is equipped with step-down transformers and frequency changers delivering, for distribution, 60-cycle, 2300-volt energy.

The Joplin substation is equipped to link together the 66,000-volt line and the 33,000-volt lines from the various plants in the Empire district, and also to distribute 2300-volt, 25-cycle energy.

New York Edison Meter No. 1 Still in Service

After seventeen years of continuous service, meter No. 1 of the New York Edison Company is still in use, as was discovered quite by accident recently. This pioneer meter came to New York in 1896 with the first shipment of the present type, and after being tested was installed in a dry-goods warehouse. Since then it has been moved six times. In the last ten years it has ticked off 2200 kw-hr., and now in its Eighteenth Street location it is working with the same accuracy shown under every test to which it has been subjected.

Although No. 1 is the oldest meter in the service of the company, it was not the first meter installed, for before the days of the mechanical meters the old chemical meters were used, as installed by Edison himself in the first days of central-station service. When No. 1 went to its present post meter No. 157,832 was just starting on its central-station career.

Weight of Electrical Apparatus and Prime Movers

By Leonard A. Doggett.

Frequently it is desirable to know the approximate weight of a given machine. To offer some assistance in this matter the curves here reproduced have been prepared after consulting a great many sources, not only the bul-

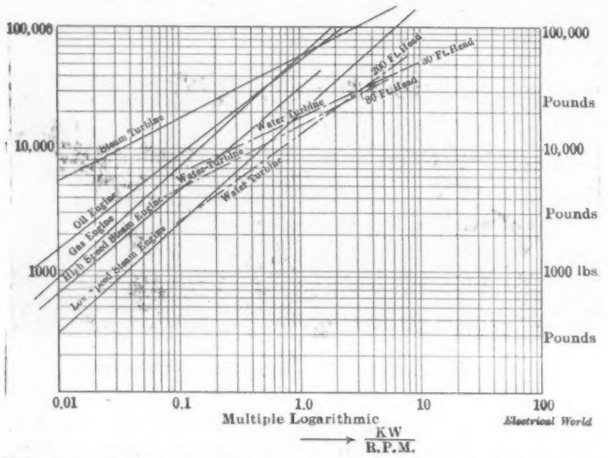


FIG. 1—CURVES FOR OBTAINING APPROXIMATE WEIGHT OF PRIME MOVERS

letins of American and European manufacturers, but also the whole literature as given in periodicals and textbooks, the only requirement being that the data must be less than ten years old and preferably not over five years.

Although the curves contain the meat of the matter, a short discussion and explanation would not be out of place. First in explanation, logarithm paper was used, because it gives straight line plots and is very economical of space. Curves of this nature can easily be extrapolated as the dotted curves in Fig. 2 whereby the weight of the smallest motors and transformers can be easily estimated. In using the curves it should be noted that for transformers the upper scale of Fig. 2 is to be used. For the machines "pounds" means weight of active material plus weight of

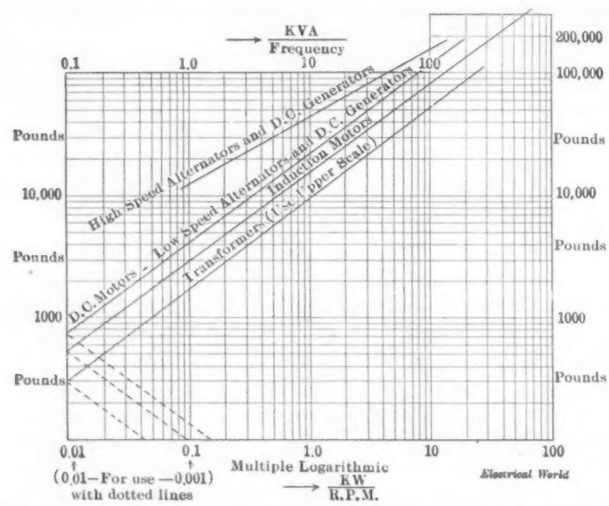


FIG. 2—CURVES FOR OBTAINING APPROXIMATE WEIGHT OF ELECTRICAL APPARATUS

shaft, spider, bearings, etc.; in other words, the total weight of the machine. In the case of alternators the abscissas are (kva) ÷ (r.p.m.); for induction motors (kw output) ÷ (r.p.m.).

In commenting on the curves of Fig. 2 it is obvious that any of these curves can be expressed in the form of an equation, for example:

Weight in pounds of a transformer, including case and oil $= 1800 \left(\frac{\text{kva}}{\text{frequency}}\right)^{3/4}$

Referring to Fig. 1, which was obtained from data given by Mr. W. B. Hird, in the *Journal* of the Institution of Electrical Engineers, September, 1912, it is evident that electric apparatus on the average is lighter than the prime mover for the same (kva) ÷ (r.p.m.).

A Method for Spot-Testing Incandescent Filaments

By C. F. Lorenz

In studying and inspecting incandescent filaments it is desirable to have means of detecting slight unevennesses in brilliancy at different parts of the filament. Bright or dark places on the filament are usually called "spots," even though they may be, say, an inch, more or less, in length. Such spots are in some cases so pronounced as to be seen readily by direct observation and in other cases they are so faint as to escape detection entirely unless use is made of some means of exaggerating them. A delicate method of detecting such spots has recently been devised and found useful in the physical laboratory of the National Electric Lamp Association. A description of this method follows.

Use of a Luminous Background and a Color Screen

The plan consists in mounting the lamp or filament to be tested in front of a brightly illuminated background and using a suitable color screen, so that an adjustment of the current through the filament will make the latter disappear against the background. The "spots" will then show up distinctly as bright lines. Another way of observing is to adjust the current until the "spots" just match the background. The main part of the filament then appears as a dark line, with an apparent gap at the "spot."

The background may take the form of a piece of "flashed-opal" glass illuminated by one or more tungsten lamps put in position back of it. Since this gives a background which differs in color from the red-burning filament, the latter cannot be made to disappear against the background by mere adjustment of the current through the filament, even though the candle-power per unit area of the filament be made the same as the candle-power per unit area of the background. The use of a color screen of some kind is necessary, and one may be applied in two distinct ways.

Monochromatic Screen Method

One way is to use a screen transmitting only a limited region of the spectrum (a monochromatic screen), this being interposed between the eye and the lamp to be tested. Equality of color appearance of the background and the filament is thus insured, and it is only necessary to adjust the current through the latter until it disappears. The plan will work no matter what color is chosen for the screen except that the transmission of the latter must be confined to a narrow region of the spectrum—thus it may be red, yellow, green or blue. But not every red, yellow, green or blue glass will do; for example, most ordinary kinds of yellow glass transmit red, orange, yellow and green light and with such a glass the red-burning filament cannot be made to disappear against the background illuminated by a tungsten lamp, no matter at what intensity the filament is run.

Considering only monochromatic screens, the question arises as to the color to use. In one respect a blue or even a violet glass would be the best, because the percentage rate of variation of intensity of light emitted by an incandescent solid with change in temperature is greater the shorter the wave-length. On the other hand, the actual intensity of the light reaching the eye may in some cases

be so much lower with a blue screen than with, say, a red screen that the advantage of using the shorter wave-length is more than lost on account of the diminished illumination. A good screen to use in any particular case may readily be selected by trial. The use of a blue screen in place of the ruby screen gives a match at a higher temperature of the filament with a given background brightness, because the light from the tungsten lamp contains a greater percentage of blue than does the light from the filament operated at low voltage. Ordinary "cobalt-blue" glass cannot be used because it transmits some red light. It is necessary to choose a blue screen which transmits no red light.

This arrangement is evidently a form of optical pyrometer, but much simplified because all lenses and images (excepting, of course, those in the eyes) are done away with. The fact that some parts of the filament are at different distances from the eyes or background introduces no trouble, as can easily be seen by considering the nature of the case or by trial; if the lamp is turned, the spots move with it.

A further modification, described in the next paragraph, does away with the necessity of looking through a colored glasss.

Orange-Screen Method

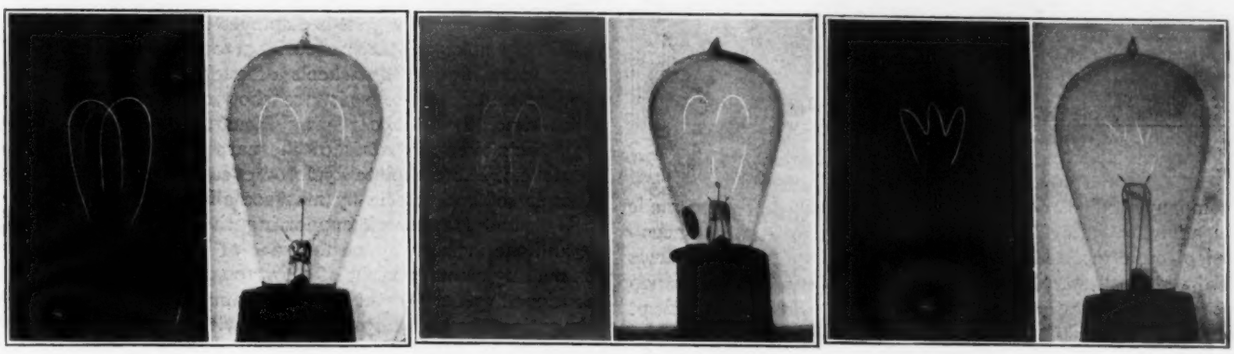
The other method of applying the color screen consists in placing it between the opal glass and the source of illumination and choosing it of such spectral transmission that it will modify the latter to match the color of the filament. Since the filament is operated at a rather low degree of incandescence its own light is deficient in the shorter wave-lengths. The screen used to modify the background light should therefore be such as to transmit red, orange and yellow light and to tone down the green, blue and violet. Such a screen has an orange appearance. A suitable orange screen may readily be prepared by dyeing a gelatine-coated plate very thinly with "Diamond dye, scarlet." Such a plate looks red by daylight, but when placed in front of a tungsten lamp it has just the right orange-red tint. It should be emphasized that the plate must be thinly dyed. More exact specifications in regard to spectral transmission are unnecessary because a serviceable screen may readily be prepared by a trial or two made in the manner indicated. The dyed plate should be placed close to the lamp and preferably several inches from the opal glass so that any inequalities in the color screen will not show on the opal glass.

As a convenient, practical way of operating, the orange-screen method will probably be preferred.

Temperature of Operation

In looking for spots it will usually be best to run the filament at a low degree of incandescence because, as is well known, the rate of variation of brightness with temperatures is greater at low temperatures than at high temperatures. If it is necessary to study the filament very close to the leading-in wires, the filament (and consequently also the background) must be brighter, since the higher the temperature of operation the less is the distance along the filament to which the cooling effect of the leading-in and anchor wires extends. In an ordinary test, running the filament at, say, 40 per cent voltage, an incandescent lamp of rather high candle-power will serve for illuminating the background. When it is desired to have the filament as bright as possible the monochromatic blue or violet method is the best because the percentage of short wave-length radiation is greater in the light of the background than in the light of the filament. Using a 250-watt tungsten lamp, an opal glass surface, say 4 in. by 6 in., can be uniformly illuminated to match a carbon lamp in the blue at about 50 per cent voltage, and this can be somewhat increased by using more lamps or special lamps. With an arc lamp one can go much higher. As an illustration, it may be mentioned that the voltage at the terminals of a 110-volt filament was 84 volts at a match, with blue glass; this, however, is merely an illustration and must not be considered the limit.

The three pairs of photographs show respectively the appearance of a filament as viewed against a black background and as matched against a luminous background for three different lamps. In the latter case it is easy to see the "spots." It should be added that a photographic plate may be made to be more sensitive or less sensitive than the eye in detecting inequalities in the brightness in different parts of a filament, especially in the case of a black background. The illustrations given are made so as to exhibit approximately what the eye sees and are not intended to show what is possible to do in the way of "spot testing" by photography. In photographing the color matching is evidently not necessary; in observing visually, however, the color match is essential for obtaining disappearance of the filament against the background.



FIGS. 1, 2 AND 3—EFFECT PRODUCED BY THE USE OF DIFFERENT BACKGROUNDS AND SCREENS IN LAMP-FILAMENT TESTING

The plan of matching lamp filaments for color and intensity against a luminous background in the manner above indicated may evidently be applied to finding at what voltage a lamp will have a given efficiency. Experiments along this line will be described in a later article.

Water-Power Development in California

The United States district forester at San Francisco states that permits have been granted for the hydroelectric development of 700,000 hp within the national forests of California. Permits for over 80,000 hp were granted during the past twelve months. The new regulations of the Forest Service make only a few unimportant changes in the method of obtaining rights-of-way for hydroelectric power development, aiming to secure the maximum amount of development of power and at the same time to provide fully for the protection of the public interests.

Central Station Management

Devoted to Discussion of Administrative Policies, Commercial Methods, and Current Practice Among Successful Utilities

Electric Pop-Corn Parties for the Children

At a number of its properties in North and South Carolina the Carolina Power & Light Company has been attracting public attention and interest by holding pop-corn parties on Saturday afternoons, when corn popped by electricity is distributed to the children of the community who visit the

A SATURDAY AFTERNOON POP-CORN PARTY

company's office. Announcements of the parties are made in advance in the local newspapers, and on the afternoon set electric grills are installed in the office show windows and presided over by picked youngsters who gleefully pop the tasty white dainty. Attendants are meanwhile kept busy packing the pop-corn into paper cones which are distributed freely among all the little people who come to the party. Mr. J. L. Kirkpatrick is commercial manager for the Carolina company.

Liability of Operating Company for Failures of Circuits

The question of the liability of an operating company for accidents arising through breaks in its circuits was brought up in a case before the Pennsylvania Supreme Court (85 A. 1117). A child left home for work and was found a few minutes later lying in the street with a burn on his hand from contact with a broken wire. Subsequently tetanus set in, the child died, and a trespass action was brought by his parents to recover damages. The claim was made that the poles were spaced improperly for safety, so that, owing to excessive sag and a large arc of sway, the wire was finally broken through crystallization (fatigue) of the metal. The trial judge ordered the jury to return a verdict for the defendant, on the ground that no specific act of negligence on the part of the defendant was shown; neither was there sufficient evidence to prove that the spacing of the poles (184 ft. apart) was a direct cause of the accident, nor was evidence introduced to show that the break occurred through sagging or swaying of the wire or through contact with an adjacent wire. In sustaining the judgment of the lower court, the Supreme Court held that, inasmuch as the evidence failed to show the cause of the break, or that it was due to negligence on the part of the defendant, or that the latter had failed to remedy the defect with reasonable alacrity, the trial judge was justified in withdrawing the case from the jury.

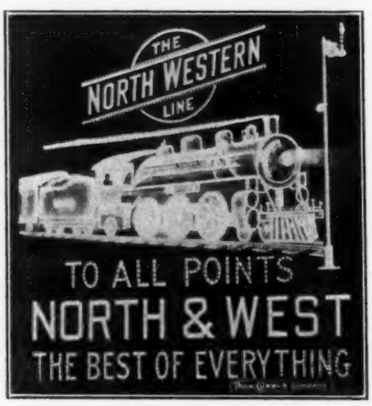
Electric Sign for Chicago & Northwestern Railroad

Railroad companies are extensive advertisers and shrewd ones also. Quite a number of them make use of spectacular electric signs, apparently with satisfactory results. One of the most recent installations of this kind, and also one of the largest, is the sign which has been placed on a freight house in Chicago on the north bank of the Chicago River facing Rush Street. This sign, which is 50 ft. square, depicts one of the latest type Mogul locomotives attached to a train of cars. A semaphore arm outlined in incandescent lamps displays "clear" and "danger" signals.

When the danger signal is displayed the locomotive stands still and smoke appears to curl out of the stack. With a clear track signal, the wheels of the locomotive begin to revolve and the side rods are shown in motion. At the same time, the smoke issuing from the stack appears to trail back over the roofs of the cars and the track seems to move. The complete cycle of events is limited to eight seconds so that passers-by may see all of the operations.

The steel framework supporting the sign weighs 29,500 lb. and the metal work on the face of the sign weighs 8000 lb., making a total weight of 18.75 tons. To give the effects mentioned, 3860 10-watt tungsten lamps are employed, necessitating the use of 30,000 ft. of wire. Color effects are secured with lamps dipped in a special coloring mixture.

Because of the weight of the sign, it was necessary to strengthen the building beneath it. Ten piers on each side of the building were reinforced by securing them to 16-in.



A RAILROAD COMPANY'S ELECTRIC SIGN

square oak posts set on a concrete foundation running parallel to the edges of the building. Four 15-in. I-beams were also used to distribute the weight of the sign.

A Reynolds-Dull flasher operates the display, energy for which is furnished by the Commonwealth Edison Company. The sign was designed and built by the Thomas Cusack Company.

Reduction in Fire Insurance Costs with Electric-Motors

BY C. J. WILLIAMS

Where electric motors replace other forms of motive power one of the lasting benefits obtained, although rarely used as an argument by central-station engineers, is the fire-insurance saving usually made.

Every form of energy-producing or energy-consuming device entails some fire hazard by reason of the heat developed. Coal, gas and oil-fired steam boilers and gas and oil engines, introduce, of course, the fire hazard of fuel in actual combustion. In the electric motor the transformation of electrical energy to mechanical work is accompanied by some mechanical and electrical losses appearing as heat, but neither in temperature nor quantity is this heat comparable with that of combustion devices.

This difference of hazard is recognized in insurance rates by the difference in proportional insurance charges. The charge for any particular kind of device also varies, of course, with the combustibility of the stocks among which the device is installed.

In mercantile buildings in states where the analytical system of fire-insurance rating applies occupancies are generally grouped, according to their contents' combustibility, as C_1, C_2, C_3, C_4, C_5, etc.—the first indicating low combustibility, the latter high. Local conditions, however, may render the occupancy of a higher or lower degree of combustibility than would otherwise prevail.

Induction motors of the brushless types are regarded as imposing practically no fire hazard in occupancies of any grade of combustibility, and no insurance charge is made for their use. Commutator-type motors not completely incased impose, on the other hand, a degree of hazard varying in occupancies of different combustibility from about 4 to 6 cents per $100 of insurance carried where combustibility is low to 20 or 30 cents where combustibility is high. Gas and heavy oil engines, with electric-spark ignition, and oil engines supplied with fuel by a pump from outside storage are judged to have about the same total hazard as the open commutator type of electric motor. A 2-cent to 3-cent charge may be added, however, even with low combustibility.

The gasoline engine in small units has been one of the most stubborn competitors of the electric motor. Where its entire supply is pumped from a storage outside the building with drainage back to the tank, and where it has electric-spark ignition, such an engine imposes a charge varying from as low as 4 to 6 cents with surroundings of low combustibility up to 28 to 42 cents with high combustibility. If flame ignition or gravity feed of gasoline is provided, the increase in hazard charge may amount to from 5 to 20 cents per $100.

Steam boilers vary in hazard depending on whether they are portable or stationary and whether they are provided with brick or metal stacks. Where stationary boilers with metal stacks are installed in mercantile buildings for power purposes the charges in insurance rates run from 24 to 36 cents for low combustibility to 48 to 72 cents for high combustibility.

From the foregoing it is readily seen that electric drive using induction motors may effect savings over other power devices from 2 to 72 cents, and where additional power devices are used this saving may be greater.

In other than mercantile buildings the saving may also be considerable, varying to some extent with the rating schedule applied. In metal mines, for example, the saving will usually amount to from 5 to 50 cents per $100 of insurance. For coal-mining properties it may be from 5 to 30 cents and for flour and grain mills and elevators from 5 cents to $1. All classes of buildings, indeed, show in the proportional insurance reductions the demonstrated lower hazard of electrical power devices.

Hints for the Central-Station Solicitor

During a discussion at the recent St. Paul meeting of the Minnesota Electrical Association Mr. T. D. Crocker, of St. Paul, remarked that a sales organization (he objected to the term "new-business department") should take care of existing customers and, of course, get new ones. It is a good plan, where practicable, to have the salesman deal with his own customers' complaints.

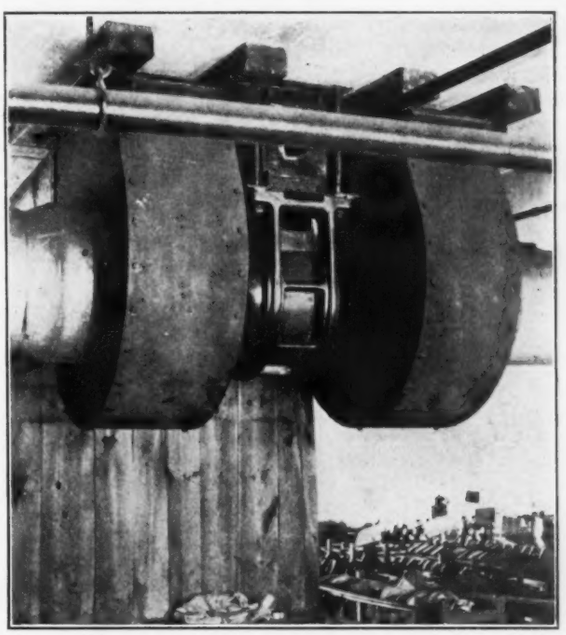
Another point to be borne in mind is that consumers should be honestly advised how to use the energy they buy to their own best advantage. In soliciting new business, said this speaker, do not magnify the advantages of electricity; don't promise what you can't perform; understate rather than overstate the case; remember that the electric-service business is a continuous performance. Mr. Crocker doesn't think much of "whirlwind" campaigns; a steady pull, he believes, is better.

Mr. E. W. Erick, of Canby, spoke as the manager of a company in a town of 1600 population where twenty-four-hour service was given from the start. In replacing gasoline engines at first the discarded machines were taken out and sold to farmers, but later, after the superiority of electric service had been demonstrated, this was not necessary; the owners of the engines were glad to get the electric service and let their old engines stand idle.

Another member pointed out the advantage of always having motors ready to rush into service in place of gas engines when the latter are in distress.

A Compact Blower Installation

The compactness of electric drive has always been one of its strongest points of recommendation. The accompanying photograph of a pair of factory blowers direct-connected to a 10-hp induction motor illustrates how efficiently such a combination may be made. In this factory these two



TWO BLOWERS DRIVEN BY ONE MOTOR

blowers are necessarily run together for drawing leather dust and scraps away from the machines of a single department, so that the motor is always run near its full-load rating and consequently at its higher efficiencies. Suspension of the outfit from the factory ceiling is also a valuable space-saving feature of the installation. Energy is supplied from the local central station.

Motorcycles for Repair and Inspection Men

The use of motorcycles in speeding the work of the repair and inspection crews of public-service corporations is being generally adopted. Having recently added a powerful twin-cylinder machine to the fleet which it has employed very successfully for some time, the Louisville (Ky.) Lighting Company now has five motorcycles. The Kentucky Utilities Company, of Lexington, recently purchased three twin-cylinder mounts with which to equip its line forces. In the case of the former company a great deal of urban territory must be covered speedily and economically, and in the case of the Lexington corporation the demand is for means of covering suburban and rural territory, as the Kentucky Utilities Company has acquired a number of plants in central Kentucky cities and towns which are within comparatively short distances of each other. The motorcycle is working admirably in both lines of service. Five machines are in the hands of the "hurry-up" force of the Louisville company, and, as it rests with the men to inspect and overhaul their mounts thoroughly every twenty-four hours, practically no mechanical trouble and a minimum of tire trouble is experienced. For inter-urban use the cycle has proved itself eminently practicable, according to the experience of the Lexington company, for the two-wheeler is frequently able to carry a man safely and speedily over roads which would be impassable for a heavier vehicle.

Satisfactory Ice-Electric Plant in Iowa

Some readers who have been interested in the data published from time to time in the *Electrical World* concerning the commercial opportunities offered to small central stations by the manufacture of by-product ice have advanced the opinion that these plants thrive only in the Southern States. The accompanying data for a plant which operates in Iowa will, it is thought, show that a long way above the Mason and Dixon line a chance to earn a handsome dividend is afforded the progressive central-station manager.

The plant referred to is an 18-ton equipment used in a town of 4500 inhabitants. During the seven months of 1912 when the plant was in operation 3500 tons of the frozen product were made and disposed of. The following is a detailed account of the operating expenses over that period:

Fuel	$1,690.77
Labor and office help	2,000.00
Water	200.00
Supplies, miscellaneous	150.00
Delivery	1,803.87
Total	$5,844.64

It is estimated that the actual plant cost of producing a ton of ice at the platform is $1.32. Rates have been established whereby the amount of ice used by a customer in a season determines the price per ton which he shall pay. To all groceries, hotels, restaurants and similar customers using from 1 ton to 5 tons of ice during the season deliveries are made at a rate of $8 a ton; if the consumer uses from 5 tons to 20 tons, $5 per ton is charged, and if an amount between 20 tons and 50 tons is used, the rate charged is $4 per ton. All customers who use more than 50 tons of ice yearly have special contracts with the company. Ice is delivered to all residences at a flat rate of $8 a ton. The following table shows the annual receipts and disbursements:

Yearly gross income from ice business	$13,039.74
Yearly expense (including interest, depreciation, etc.)	6,826.68
Net income from ice business	$6,213.06

The total plant investment, inclusive of delivery wagons and storage facilities, amounts to $12 200. In commenting upon the success of this ice-electric plant, which shows a 50 per cent net return, its manager very modestly says that he has found the by-product ice business satisfactory. He attributes not a little of the success to the practice of handling all sales by the coupon-book system, no cash sales being made from the wagon.

Comparative Operating Expenses of Horse, Electric and Gasoline Commercial Vehicles

Perhaps the ideal method of comparing operating expenses on different types of commercial vehicles would be to give the unit cost per ton-mile. It is not always practicable to secure this information, however, owing to the variation in methods of figuring costs by those operators of commercial vehicles who keep records. In the present article the figures are given per car-day, and they are derived principally from the carefully kept comparisons of the Commonwealth Edison Company of Chicago relating to horse and electric vehicles, with some additional data relating to gasoline wagons obtained from Marshall Field & Company, of the same city.

Horse Vehicles in Central-Station Service

During the year 1912 the Commonwealth Edison Company had 130 horses, 107 horse vehicles and 72 electric vehicles in service. Allowing a deduction of 6 per cent in the number of wagons in service at a time because of repairs or of horses being shod, idle or sick, there remain 101 horse vehicles with which to average the expenses. These expenditures are grouped under the following heads:

Feeding, shoeing and veterinary service	$29,712
Labor in barns and repairs to buildings	20,176
Repairs on horse vehicles	11,088
Total for the year 1912	$60,976
Cost per horse vehicle per month	$50.31
Driver's salary	60.00
Supervision per vehicle per month	4.6
Rent of barn per vehicle per month	4.05
Municipal wheel tax per month	0.4
Interest at 5 per cent, depreciation at 10 per cent, taxes at 1.5 per cent, insurance at 1 per cent	5.73
Total cost per month	$125.18
Average cost per day per horse vehicle in service, on the basis of 25.5 days a month	$4.91

Uses for Electric Vehicles in Central-Station Service

Twenty of the seventy-two electric vehicles owned by this company are used in carrying supplies from warehouses to customers' premises. About thirteen cars are employed for making lamp renewals, and ten trucks are used for installing small overhead-line extensions which do not involve the setting of poles. The remaining vehicles are used for delivering meters, for underground-line work, installing signs and pulling cables through conduits by means of the vehicle motors.

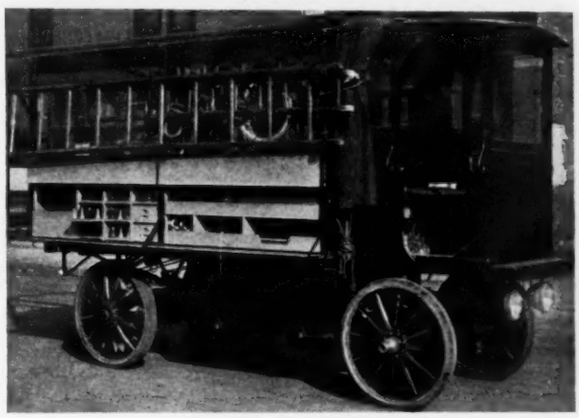
In size the electric vehicles range from 700 lb. to 4000 lb. in carrying capacity, the average being about 2500 lb. As the average time that they have been in service is about twenty-six months, the owner figures that the maintenance charges have reached a value that can be regarded as fairly typical of the service.

The electric wagons used by the overhead department were designed to carry all of the tools and materials used for installing the customer's service wires. Compartments for holding the supplies are arranged so as to be readily accessible to the linemen. Above these compartments are racks for holding cross-arms. Hooks are arranged on both sides of the truck for supporting coils of ropes and extension ladders. There is no room on the truck for anything except what is absolutely required, thus preventing the accumulation of junk.

In addition to the seventy-two electric commercial vehicles mentioned, the Commonwealth Edison Company owns three large electric trucks capable of carrying 3.5, 5 and 6 tons each. The largest one is used for hauling coal and the other two are employed for carrying reels of cable. The results obtained with the electric vehicles have been so satisfactory that this company is contemplating placing in service thirty more, some of which have been ordered already.

Operating Expenses for Electric Vehicles

Operating, repair and other maintenance charges on the electric vehicles owned by the Commonwealth Edison Company for the year 1912 are tabulated below. The number of vehicles in service at a time is taken as forty-seven in averaging the operating expenses.



ELECTRIC VEHICLE OF CENTRAL STATION

Although the maintenance charges on electric vehicles are about 50 per cent more than those on horse vehicles, this increased expense is more than offset by the saving in time in traveling from one job to another. A horse vehicle can cover about 15 miles a day in delivery work, while an electric vehicle averages about 29 miles a day on similar work. The saving may not be apparent here, but in case men who are paid 40 cents an hour are being transported to a job, any time saved represents a net profit.

DATA ON COMMONWEALTH EDISON ELECTRIC VEHICLES

Expenses	Total 1912	Cost per Month per Vehicle in Service	Cost per Day per Vehicle in Service
Supplies	$2,938	$5.21	$0.20
Painting	901	1.60	0.06
Tire replacement	2,838	5.03	0.20
Battery repairs	4,858	8.61	0.34
General repairs	11,574	20.52	0.81
Washing, placing wagons on charge and minor repairs	8,136	14.43	0.57
Maintenance of garage building, including rental	8,243	14.59	0.57
Total	$39,488	$69.99	$2.75
Operating and repairs as shown above	.....	$69.99	$2.75
Energy, at 4 cents	.....	17.68	0.69
Driver's salary	.....	65.00	2.55
Supervision	.....	4.72	0.19
Wheel tax and state license	.....	2.50	0.10
Depreciation (total cost of wagon less original cost of tires and battery spread over eight years)	.....	20.00	0.79
Interest, taxes and insurance	.....	8.33	0.33
	.....	$188.22	$7.40
Average miles per vehicle per month, 749			

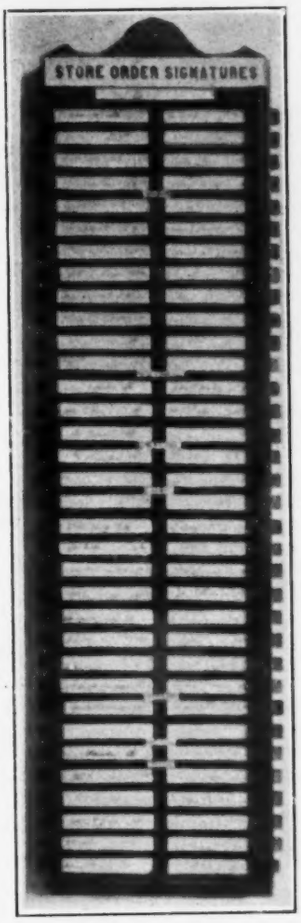
Some Gasoline-Vehicle Figures

Although the electric vehicles used by the Commonwealth Edison Company and the gasoline vehicles used by Marshall Field & Company, of Chicago, are used in distinctly different kinds of business, yet they operate under practically the same traffic conditions and both are used for making deliveries. The electric vehicles under consideration are subjected to severe duty because of the heavy material handled, while the large gasoline trucks of the department store are used for hauling packages that are of large size but of very much less weight than the material carried in the electric wagons.

Marshall Field & Company estimate an average maintenance cost of $14 per day on their gasoline vehicles. To explain this high figure, it may be said that they use their gasoline cars only for transporting packages to centers of distribution which lie in the outlying portions of Chicago, so that perhaps a larger mileage is made. It would be necessary for these cars to travel 55 miles a day to bring the operating cost down to that given by the Commonwealth Edison Company for its electric vehicles, which are said to average 29 miles a day. If the gasoline cars did cover 55 miles a day they were working under the most favorable conditions, as the increased expense of gasoline cars over electric vehicles is conspicuous mainly on short hauls.

Signature Frame for Storeroom Reference

In the storerooms of the Consolidated Gas, Electric Light & Power Company, of Baltimore, Md., the usual method of notifying the storekeepers and attendants by letter concerning which officials are authorized to approve orders for material and supplies has been replaced by the simpler scheme of using a "live signature" frame like that illustrated.



SIGNATURE FRAME

The frame is made up of small wooden paddles covered with white paper and fitted into grooves behind the glass front. The names written on these paddles can be quickly referred to by the storekeepers, whereas heretofore it was necessary for these men to pore over numerous letters to ascertain if signatures appearing on store orders were "O. K." to draw material. These paddles may be readily changed, insuring an up-to-date list at all times.

Store orders sent to the Front Street storeroom from the other stations are first referred to the clerical department, where from a separate frame, which shows the names of those authorized to approve store orders for the other stations, it is determined whether the order shall be honored or not.

The clerical department is allowed to see these orders first, since it is sometimes the case that the quantity on hand of the material desired (which can be readily ascertained from the stock cards) may not warrant the issuance of the same. If the material wanted can be spared, the order is properly approved and is sent to the storeroom to be filled.

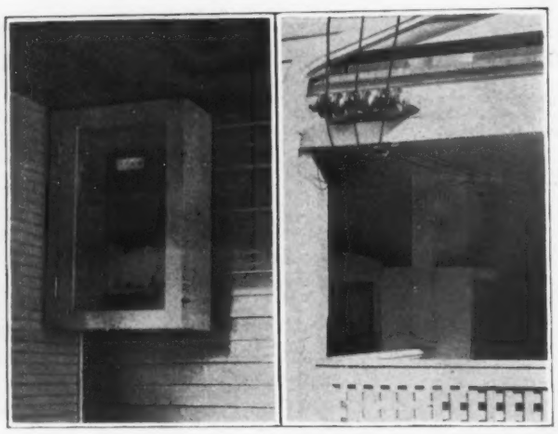
Illumination and Wiring

Back-Porch Meter Installations

In a great many small towns and villages where overhead distribution prevails, and where the service is usually brought in through an attic or down to the cellar from above through conduit, meters must of necessity be installed in out-of-the-way places within the house, so that once a month at least the occupants are disturbed to permit the meter reader to see the index of the meter. In not a few localities meters are installed in upstairs closets or in bathrooms, because country houses are not always provided with cellars. At any rate, the house must be entered in order to read the meter register, and if the owner or tenant is not at home the meter reader is compelled to call a second and in some instances a third time.

In small communities where the consumption of electrical energy is small and where the houses are all detached the central station must keep down labor costs as much as possible. If, for example, a meter reader receives $2 a day and it is necessary for him to make two or three separate trips in order to read a meter, the time consumed figured in cents represents possibly more than the profit derived from the sale of energy to the customer in question that month.

To render it possible for a meter reader to read a maximum number of meters in a minimum of time, many companies have established the policy of locating meters on the front or back porch of dwellings. To some managers this practice does not appeal, because the meter is exposed to climatic conditions and it is an easy matter for persons outside to tamper with the meter or even steal it.



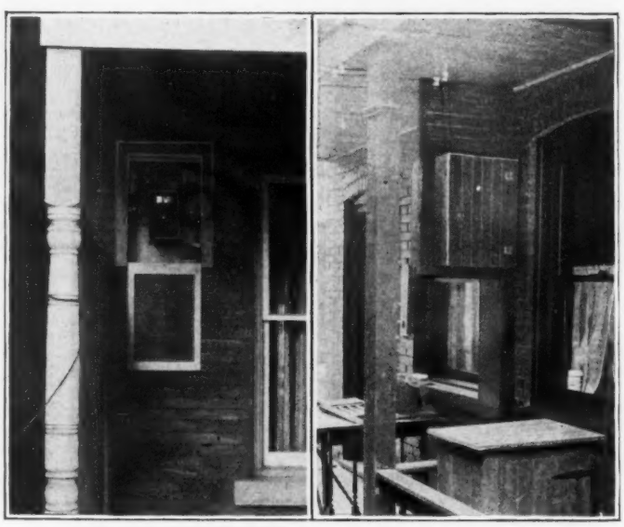
FIGS. 1 AND 2—SERVICE ENTRANCE AND METER INSTALLATIONS ON PORCHES

Where meters have been thus installed, however, the experiences of the companies show these fears to be groundless. There is only one drawback where meters are placed outside in cold climates, and that is that in winter they cannot be tested with any degree of comfort. This, however, is only a minor consideration, as companies can arrange to have these meters tested before cold weather sets in and thus obviate the necessity, except in rare instances, of testing meters during the winter months.

One of the first companies, if not the first, to establish the practice of installing meters on back porches was the Renovo Edison Light, Heat & Power Company. Renovo is a railroad town of approximately 4500 inhabitants in the mountains of Pennsylvania. Situated betwen high hills, it is compactly built. With the exception of the main business streets, however, the houses are all detached, being separated usually by small areaways. Experience extending over a number of years has enabled the company to standardize its meter practice so that architects and builders now provide small cupboards at the rear of the houses for meters. Indeed, it seems to be the natural practice of the community to meet the wishes of the lighting company in this respect as though the thing were established by ordinance. Under the conditions obtaining at Renovo it is possible for one man to read 300 meters a day, and that record has been established time and again by Mr. F. M. Noecker, the general manager of the plant, who takes upon himself the duty of reading all the meters.

FIG. 3—INSTALLATION ON SEMI-DETACHED FRAME HOUSES

The outdoor method of installation has other advantages. It is unnecessary to enter a house to read a meter, so that it makes no difference whether the owner is at home or not. It avoids any ill feeling on the part of the housekeeper toward the lighting company by reason of the fact that a meter reader may have forgotten to wipe his muddy shoes before entering the house. It avoids the probability of a customer tampering with the meter, because if he did so his next-door neighbor would see him. Altogether, the scheme has worked excellently.

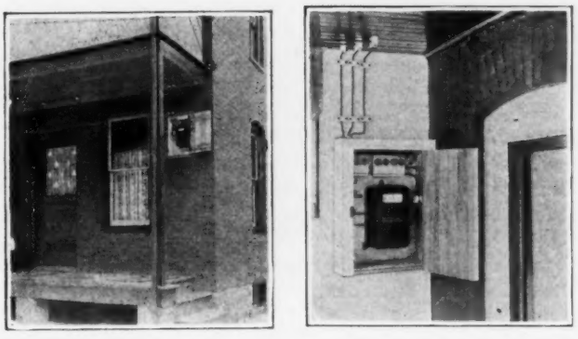


FIGS. 4 AND 5—METER CABINET SET FLUSH IN BRICK WALL, AND CABINETS ON PARTITION

In the business sections where detached houses do not prevail and where there are a number of tenants in the same house the meters are installed in closets in the main halls, where they are accessible without climbing stairs, a consummation devoutly longed for by many a weary meter

reader. That the practice of the Renovo company may be more readily comprehended, a few typical installations have been selected for description. In all cases the meter box is installed at the expense of the customer.

Fig. 1 shows an old frame house with the meter box installed on the side porch. Three circuits are provided on the house side of the meter, two for lamps and one for



FIGS. 6 AND 7—CABINET SET IN BRICK WALL AND ON PORCH OF BRICK DWELLINGS

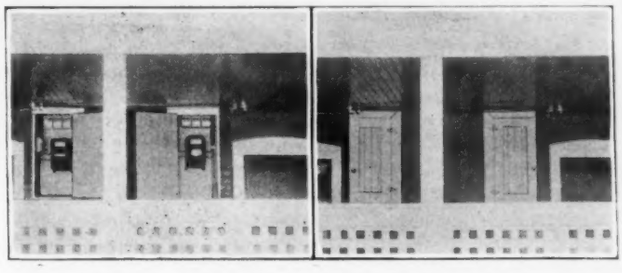
heating devices. It will be noticed that an inexpensive box with a glass in the door is employed and that in this instance the cabinet is not built in the wall.

A better method is that used with many of the newer frame houses, where the meter box is built into the partition of the house on the back porch. Three circuits are connected to the meters as in the installation shown in Fig. 1.

Fig. 3 shows an installation on semi-detached houses, the cabinet being set in the partition of the house on the back porch and the service being run on knobs across the porch from house to house. This illustration shows an every-day condition, and certainly if the milk is safe the meters ought to be more so.

Fig. 4 shows an installation in a brick wall, the cabinet being set in the wall and having a sliding door flush with the surface. Another method of mounting meters on brick houses is shown in Fig. 5, illustrating the back porch of a double brick dwelling. The back-yard entrance is through a subway over which the meter box is built. The middle partition serves as the back for the two meter boxes and, extending to the porch ceiling, forms a raceway for the wires of each side of the twin residence. The support next the brick wall forms a raceway to the cellar for a flexible steel conduit containing the heating circuit. The practice of the company is to run heating circuits under the first floor and up into the rooms.

The type of meter box construction shown in Fig. 5 is employed where there is not sufficient room to build the



FIGS. 8 AND 9—METER CABINETS OPEN AND CLOSED

meter cabinet in the wall of the building. The meters are within easy reach from the porch floor, and the bottom of the cabinet is at the same height as the bottom of the upper window sash so that it does not interfere with the light entering the kitchen.

Another illustration showing a meter box on the rear porch of a detached house is given in Fig. 6, the box being set in the wall with the door flush with the finished wall. Fig. 7 shows another instance of a double brick dwelling where the cabinet could not be built in the wall for lack of space. The extension at the top of the box reaches to the porch roof, forming a raceway for the wires for the interior circuits, the porch ceiling and the ceiling of the first floor of the dwelling being at the same height. The builder is usually provided with the number of conduit pieces to lay in the wall at this point between the ceiling and floor so that the wires from the cabinet can enter the building. Here again it may be observed that if the household necessities shown are safe the meter ought also to be safe. Another view of the same installation is given in Fig. 2 in order to illustrate the present practice of the company in running services to the building. The secondary rack shown is much neater and more substantial than three separate brackets. It should be mentioned in this connection that in all cases where the cabinet is on the outside the service lines run directly to the cabinet before entering the building. Where the meter cabinet is inside the building, as in Fig. 10, the service is continued in conduit from the outside of the building to the meter cabinet.

It will be noted that in many installations the meter cabinet door is fitted with a pane of glass, while in others wooded doors are used. Of course, where the glass is em-

FIGS. 10 AND 11 — METERS GROUPED IN BUSINESS BLOCK OR APARTMENT HOUSES, AND METER CABINET WITH DOOR SHUT

ployed it is unnecessary to reach up to open the door, and the meter can be read more quickly. In many instances, however, the owners and builders prefer wooden doors and the tendency is toward much neater construction of the cabinets. This is indicated in Figs. 8 and 9, which show an installation on back porches with the doors open and closed. When the door is shut, as it always is except for the minute it is opened to read the meter, the cabinet is less conspicuous even than a shutter.

Fig. 10 shows the method employed of grouping meters in business blocks and apartment houses. The meter closet is located in a public part of the building, usually the hallway; but in some cases where the hallway is not the center of distribution the cabinets are placed on the rear porches. In cabinets of this type a receptacle or ceiling rosette is tapped to the main line ahead of the switch so that a lamp can be inserted and lighted by a man hunting for trouble on a circuit. This group was not entirely complete when the picture was taken. That a cabinet this size does not detract from the appearance of the interior of the building is shown in Fig. 11, which shows the same closet with the door shut. There is nothing to indicate that the door belongs to a meter cabinet because the door and trim match the other doors and trim throughout the building.

The Renovo Edison Light, Heat & Power Company started this method of installing meters twelve years ago, and during all that time, the manager states, not a meter has been disturbed nor has a single case of theft of electrical energy been detected. Moreover, the meters have not shown any appreciable effect from weather, because, being inclosed in a cabinet containing still air, the inside temperature of the cabinet was not affected as much as one would suppose. Fully 80 per cent of the company's electric meters are now accessible without requiring the meter reader to enter the private part of any building in which they are located. The boxes are lined with asbestos to meet the underwriters' requirements.

Lighting the Way to Business

A somewhat unusual installation of display lighting is illustrated in the accompanying photograph of an alley at Hartford, Conn., leading to a popular restaurant in the

DISPLAY LIGHTING IN A HARTFORD ALLEYWAY

downtown district. The alley is roughly 100 ft. long and 8 ft. in width, and each side is illuminated by forty-one 16-cp incandescent lamps wired in multiple and carried on pipe conduit run along the sides of the bordering buildings at an average height of about 8.5 ft. above the sidewalk. The lamps are spaced about 30 in. apart on centers and give a pleasing and attractive aspect to the approach to the restaurant, establishing an avenue of light to its front door during the evening hours.

At each end of the alley is an electric sign of semi-circular shape, bearing the name of the establishment, and near the ends two 40-watt lamps have been hung over the center of the walkway to provide an even more brilliant illumination. The side lamps are supported immediately under reflecting troughs painted white on their under sides, and the whole installation is attached to the building walls by short iron brackets and braces. The use of electricity in this case goes far to offset the disadvantages ordinarily arising from a location somewhat removed from the main thoroughfares of travel.

Electric Signs in City Streets

At a recent meeting of the committee on downtown streets of the Chicago Association of Commerce Mr. John F. Gilchrist explained the position of the Commonwealth Edison Company in relation to electric signs projecting over sidewalks. Mr. Gilchrist said that his company would be glad to co-operate to mitigate any possible abuse in the matter of projecting electric signs. He reminded the committee of the illuminating value of street signs, stating that it has been noticeable in Chicago that when the city lighting service is not in operation the decrease in illumination in downtown streets is hardly noticeable on account of the flood of light from electric signs, window lighting and various forms of decorative exterior illumination.

In Chicago electric signs, erected in compliance with the requirements of the ordinance, are permitted to project over the sidewalks as far as the curb. This is the practice in a large number of other cities, although in a few municipalities other restrictions are made. In New York, for instance, projecting signs may extend from 5 ft. to 8 ft. beyond the building lines. St. Louis permits signs to project not more than 24 in. on broad streets and 18 in. on narrow streets. In Philadelphia projecting electric signs are not permitted at all at the present time on four of the principal streets. On the other streets there are no restrictions. A San Francisco requirement is that signs shall be rung on pivots, permitting them to be swung back against the building during the day. In many European cities it is forbidden to extend signs of any character beyond the property lines.

Recent Telephone Patents

Receivers

Almost all telephone receivers have employed the system whereby the direct magnetic action of the poles was brought to bear upon the diaphragm. An exception to this method was the electro-motograph used by Edison wherein the diaphragm was driven by a friction point trailing on a moistened revolving cylinder. The friction between the point and cylinder varied with the current through their contact; thus the mechanical power of rotation was adapted to drive the receiver diaphragm.

The telephone receiver recently patented by Mr. S. P. Grace, of Pittsburgh, uses this principle, in that mechanical energy of a rotating cylinder is used to drive the diaphragm. In this case, however, the friction drive is done away with and the mutual inductive reaction of eddy currents serves to transmit the power. The usual receiver-pole pieces are supplemented by a pivoted magneto frame, one leg of which is associated with each pole piece. This auxiliary pole piece is so formed that it spans a considerable area of a thin copper disk with a very small length of air-gap. The disk is caused to rotate constantly and a uniform turning moment is developed in the auxiliary pole structure owing to the constant action of the permanent magnet in the receiver. This turning moment is resisted by the diaphragm, which is connected by a link to the top of the auxiliary pole piece. When the field magnetization is varied by incoming currents, the reaction between the auxiliary pole piece and the revolving disk is varied accordingly. Thus the mechanical rotative force is transmitted to the diaphragm, providing a means for increasing the energy at the receiver.

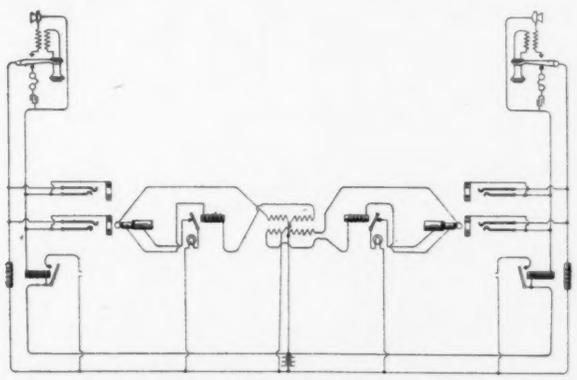
Mr. C. L. Chisholm, of Marysville, New Brunswick, has patented a receiver. The novelty of this appliance lies in mounting the diaphragm in a ring, so as to avoid any initial strains when the ear cap is screwed home, and in turning the ends of the pole pieces into a plane parallel with the diaphragm. The ends are then so shaped that the field is virtually circular and concentric with the diaphragm.

SWITCHBOARD CIRCUIT SYSTEMS

Mr. H. P. Clausen, of Chicago, describes a system in which the line relay is permanently connected to one side of the line but becomes shunted by the low-resistance apparatus of the cord circuit. According to a second patent a relay with a double winding serves as the battery feeder to the line during the calling period, the line relay being included in the circuit. The double-wound relay at this time is differential and remains stationary while the line relay operates. When a plug is inserted the balance is disturbed. Then the double-wound relay responds, short-circuiting both the line relay and one of its own windings. This permits the second winding to co-operate with the cord circuit in retarding battery current during the talking period. Both of these patents are assigned to the Stromberg Carlson Company.

A third patent granted to Mr. Clausen and assigned to the Stromberg-Carlson company describes a switchboard circuit system. In this system the most noticeable feature is the method of controlling the line relay. This is so connected that as soon as it is operated it is automatically locked in, and the line lamp is energized constantly after the first attempt to call until the response of the operator in the line jack. Other features of the invention concern details of arrangement of the usual parts.

Another patent assigned to the same company has been granted to Mr. C. L. Goodrum, of Philadelphia. In this



CENTRAL-ENERGY TELEPHONE SYSTEM

system, shown in the accompanying illustration, the circuit may be traced, showing the line relay shunted by one section of the repeating coil. The doubling back of the supervisory lamp circuit through the strapped tip and test-ring contacts of the jack is also shown.

Mr. N. L. Johnson, of Chicago, has made particular provision for a pilot lamp in the cord signals of his circuit. He uses direct acting magnetic signals to display the lamp. A back contact is made in series with an auxiliary contact in the jack. The latter is closed when a plug is in. The pilot lamp is included in this circuit and glows from the time the signal is restored till the plug is removed. This patent is assigned to the Corwin Telephone Manufacturing Company.

IMPROVED APPARATUS

Successful operation of make-and-break contacts requires platinum points. However, in telephone work on account of the very minute currents employed the weight of platinum required is fixed by the required physical manipulation rather than by the current-carrying capacity. An invention by Mr. F. M. McBerty, of New Rochelle, N. Y., is devoted to the co-ordination of these two factors. He uses a very thin sheet of platinum foil upon one side of which copper is electrolytically deposited. The platinum thickness suggested is one-thousandth inch; the copper thickness one-fiftieth. The contact pieces are stamped from this stock and inserted in the contacting parts under pressure so that they flatten out and lock themselves into place. The patent for this invention is assigned to the Western Electric Company.

Two antiseptic devices for transmitter have been invented and patented by Mr. G. S. Bennett, of San Francisco. Sanitary paper is used for both. They have as a special feature a compulsory change of paper. To this end one of the types has an automatic device for feeding the paper while the other has a shield which must be removed from the transmitter in order to permit the use of the telephone. This removal feeds fresh paper.

Letters to the Editors

Co-operation Between Central Station and Manufacturers

To the Editors of the Electrical World:

SIRS:—Your reports of the Society for Electrical Development were read with a great deal of interest. The plan of the society seems hardly strong enough to awaken the new-business managers of central stations. It seems strange to the writer that central stations have not been willing to spend more money in introducing electric-cooking devices. Nearly every one of them maintains a display room, but none of them seems to meet with the kind of success that is obtained when the manufacturer goes out and sells the goods. This may be occasioned by the fact that the manufacturer sends out a specialist, which, however, the central station should do because the larger end of the profit falls to the central station. The fact is that the central stations buy one or two appliances and merely place them in the show window. They may even send out a few circulars with their monthly bills, but they have no proper and complete follow-up system. The whole sum and substance of the matter is that each one is waiting for the other person to become active.

The central stations should foster the development of electric cooking by ordering liberally from the manufacturer and by active public demonstrating, following this up by active canvassing. They should place the appliances in the household on easy terms, as, for instance, putting them in on a payment down, with the balance in monthly instalments, and should advertise this fact in the local papers. By featuring this excellent method of day-load consumption they will reap the ultimate profit. They cannot expect the manufacturer to spend all his profit in building up a business for them. In other words, the central station should help the development of the business by co-operating with those manufacturers who are directly helping them to build up a profitable load.

A. L. SYKES,
President the A. L. Sykes Manufacturing Company.

Cincinnati, Ohio.

Skin Effect

To the Editors of the Electrical World:

SIRS:—In his letter on page 683 of your issue for March 29 Mr. Louis Cohen makes use of a formula for skin effect which differs somewhat from the formula for this effect used by other writers. The difference noted is one that could easily have been made in transcription, and probably the error in form is attributable to this cause.

Pittsburgh, Pa. R. W. ATKINSON.

To the Editors of the Electrical World:

SIRS:—I am glad that Mr. Atkinson has called attention to the error in the formula given in my letter. The correct formula is as follows:

$$r\,(ma) = \frac{ma}{2}\,\frac{ber\,(ma)\,bei'\,(ma) - bei\,(ma)\,ber'\,(ma)}{ber'^{\,2}(ma) + bei'^{\,2}(ma)}$$

A comparison of the formula with the one given in my letter will show plainly how the error crept in.

Washington, D. C. LOUIS COHEN.

Field of the Operating Engineer

A Record of Practice, Experience, New Ideas and Interesting Problems—Notes on Practical Subjects—Questions and Answers

Troubles Due to Non-Use of Circuit-Breakers

By F. W. Harris

Sometimes trouble develops on the best of apparatus owing to a misunderstanding of the proper care necessary, and often such trouble is very easily preventable. A common source of complaint is the heating of the contacts of carbon circuit-breakers after the instrument has been in service for a long period. These breakers, as commonly constructed, have a laminated brush made up of thin leaves of copper, and any temperature over a certain very well-defined maximum will result in the brush becoming soft and losing its elasticity. Therefore the heating becomes very much worse, rapidly approaching a crisis which results in a more or less total ruin of the brush and sometimes a shut-down of the plant.

Troubles of this kind are commonly attributed to the design of the circuit-breaker itself, and while it is true that different makes of such instruments show a different degree of resistance to this trouble it is more or less general among all types under certain conditions. The writer, who has personally examined a great many cases of such trouble, was soon convinced that a great deal of the difficulty was due to conditions against which no modifications of the design could be expected to guard.

Heating of contacts is very noticeable in steel mills, and one case of long-continued trouble resulted in dismantling the circuit-breakers on three successive July Fourths, this being the most convenient day to the mill superintendent. The case was quite typical of general conditions, the instruments being rated at 10,000 amp and running on a load much below this. After they were put in first-class condition they ran quite cool for some months, the heating gradually increasing until they had to be overhauled again. As stated, the total cycle was about one year. Significant was the fact that there were some additional circuit-breakers of the same type in the same plant that were carrying a load somewhat in excess of their rating and were daily called upon to open heavy overloads and yet gave no trouble.

An examination of conditions showed that the troublesome circuit-breakers were connected on a circuit that was never opened except upon dead-short-circuit conditions, and it further developed that these conditions did not obtain more than once or twice a year. In other words, the circuit-breakers were left closed for months at a time. The other instruments were on an individual motor circuit and opened every time the motor was overloaded, which might be several times a day. In addition, they were opened manually whenever the motor was shut down, which was always several times a day.

The whole trouble was traced to a gradual oxidation of the contacts and to the fact that the troublesome circuit-breakers were never opened and closed to rub off the oxide. It was found that if the instruments were opened and closed a few times on Sunday it was possible to keep the contacts bright. The circuit-breakers that gave no trouble were naturally satisfactory, as they opened many times a day and that kept the contacts clean.

In general, where open air-type switches are not operated frequently it is an excellent plan to clean them with emery cloth at least once a month, and where the contacts are not easily accessible, as in this case, they should be opened and closed vigorously say a dozen times once a week. This is no great burden to the operator and will save repair bills.

Replacing a Broken Valve Seat

By W. H. Wakeman

The engineer in charge of a certain improved Greene engine concluded that there was something out of order with his exhaust valves, as a slight noise indicated that some of the parts were loose or broken. On taking these valves out for examination, he found that the head-end valve and seat were in good order, but the valve seat on the

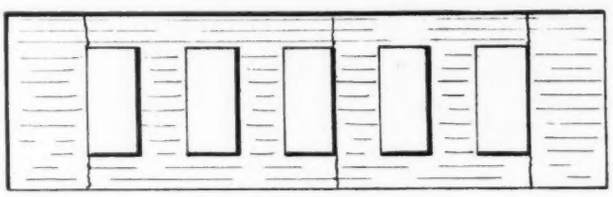


FIG. 1—CRANK-END VALVE SEAT SHOWING THE POSITION OF THE THREE BREAKS

crank end was broken in three places, as indicated in Fig. 1. This seat was not cast with the cylinder, but was made separate and fitted into a circular place provided for it. Two cap screws, put in from the under side, hold it in position, one at each end, as shown in Fig. 2, which is a side elevation of the seat. The ports are cored out enough to make a weak casting, as it is not supported at the center.

The fractures were not new, but had been there so long that the slight motion of the broken parts caused by the valve moving over its seat had worn the surfaces perfectly smooth.

Although the engine had been running in this condition for an indefinite time, the engineer declined to run it longer until a new seat was put in. A suitable casting was secured from the builders and machined until it fitted into place. The valve face was planed off, making a good fit on the seat, thus preventing all leakage at this point.

If this valve seat had been cast in one piece with the cylinder, it would not have broken. On the other hand, this

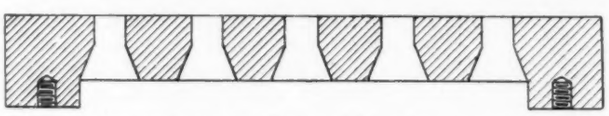


FIG. 2—CROSS-SECTION OF THE BROKEN PART AND TAP SCREWS WHICH HELD IT IN PLACE

part does not wear evenly and it is therefore often desirable to replace it. One edge of each port wears more than the other; hence ridges are formed that cause the valve to leak, especially if it is found necessary to lengthen or shorten the valve stem to give more or less compression to secure quiet operation. With a removable seat it is possible to plane the surface at small expense, thus restoring perfect conditions.

Supply of Cooling Water for Power Stations

By Fred Buch

With the immense size of water-cooled transformers now coming into use and the introduction of water-jet eductors and water-cooled apparatus in the power house the problem of the cooling-water supply and distributing system is receiving considerable more attention than was the case only a few years ago. Water was formerly taken from the nearest convenient place, almost regardless of requirements or conditions. A pipe line with a screen at the intake end and a cut-out valve in the power house then seemed quite sufficient and no working drawings were considered necessary. However, with the rapid growth of the size of apparatus and the general changes and advances in power-house layouts, the cooling-water system has been obliged to keep pace, until at present it has developed into a more or less complex system that requires the same care and attention as do the more intricate parts of power plants.

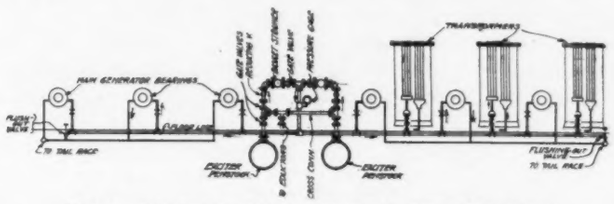


FIG. 1—DIAGRAM FOR HIGH-HEAD DEVELOPMENTS

The water supplied for cooling the shaft bearings and transformers must be free from silt or grit and suspended matter, and sometimes free from air. To accomplish the former, strainers are fitted into the intake lines, and where this will not suffice settling basins or tanks must be resorted to, while for the latter de-aerating or storage tanks are frequently built at considerable expense. Where this water is required at a certain low pressure due to the design of the coils within the oil-immersed transformers, these tanks are located at the proper elevation to give the desired pressure and all water is passed through the tanks. The water must be taken from at least two separate and independent intakes so as to present a deficiency in the supply, regardless of shut-downs or accidents. Controlling valves must be arranged so as readily to by-pass from either intake to the distributing header, and these valves should be in the most accessible place in the power house within instant reach of the operator.

High-Head Developments

In power plants with a high head of storage water it is customary to take the supply for the cooling system from the main or exciter penstocks in the power-house floor, as this will require the least piping. The pressure, however, should be reduced unless the cooling coils within the transformers are especially designed to withstand this pressure. Fig. 1 shows diagrammatically the arrangements for such conditions in a power house having six main generators and three large water-cooled transformers. Water is taken from the exciter penstocks through saddle nozzles and a cross-connection between the two fitted with cut-out valves so that the distributing system may be supplied from either penstock. From the cross-connection the water passes through one of the two sets of pressure-reducing valves and basket strainers to the distributing headers leading to the transformers, main generator bearings and toilet rooms. There is also a connection for the water-jet eductors used for pumping out the sump in the substructure. These eductors are used occasionally only while the cooling system is in constant use. In the case here shown the eductor connection was of the same size as the intake pipes from the penstocks, and cut-out valves were therefore arranged so that the distributing system could receive water from one penstock while the eductors took their supply from the other and thus there would be a full supply of water in both systems.

The requirements for cooling the oil in the transformers are usually specified by the makers. In this case the pressure desired was 25 lb. and the velocity from 3 ft. to 4 ft. per second. As the pressure at the intake end of the system was about 100 lb., a pressure-reducing valve reducing from 100 lb. to 25 lb. was fitted and a basket strainer supplied to catch the floating matter. The wire baskets in these strainers are easily removable from the casing and the cleaning will therefore not require much time. It is good practice to supply the strainers with an inlet and outlet end about twice the diameter of the line into which they are to be fitted so there will be no choking of the water as it passes through the fine meshes of the basket, especially when these have become more or less clogged. Special flanges to fit the strainers must be provided and valves fitted for cutting out the strainers and the reducing valves from the line so that they may be cleaned or overhauled. It is for this reason that two of these lines are supplied, the water being by-passed through one line while the other is being put back into working order. In the pipe leading from the strainers to the distributing header a pressure gage is fitted to act as a telltale and indicate that the reducing valves are working properly. As these valves are very apt to "kick" and go wrong, this telltale arrangement is very desirable.

Where the pressure reduction is great it may become necessary to fit two reducing valves in series, the first reducing the pressure from, say, 200 lb. to 110 lb. and the other from 110 lb. to 25 lb. With this series arrangement there is no great strain on the reducing valves and they will not "fail" so easily as would otherwise be the case. Most reducing valves must be cut out from the line by closing the gate valves on both sides of them before any overhauling or readjusting can be done, but there has recently been placed on the market a regulating valve for which the makers claim that it can be put back into working order in a very few moments without shutting down the system and without losing any of the pressure in the line, unless regrinding is necessary, the valve being so arranged that it can instantly be adjusted to any desired pressure by simply turning a hand-wheel and then opened and examined with the water flowing through the valve at service pressure. This valve is made by the Crane company.

Low-Head Developments

Where no great pressure is developed at the intake, or where water is plentiful at all times and economy is of less importance, no pressure reduction should be necessary provided the cooling coils in the transformers and all other fixtures are designed to meet the pressure. In this case an arrangement such as shown in Fig. 2 is applicable. Water is taken from the nearest source of supply and all details are similar to the arrangement shown in Fig. 1 except that the pressure-reducing valves and telltale gage have been omitted. It is well in cases of this type, where there is no pressure regulation at the intake, to run a large distributing header from the strainers throughout the power house and reduce the branches to the transformers and other apparatus to the proper size, placing two globe valves in

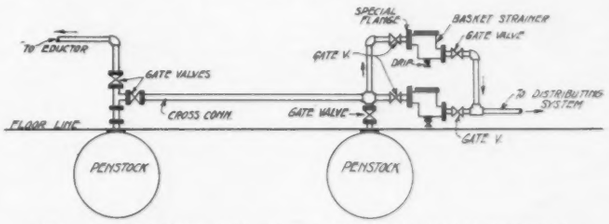


FIG. 2—CONNECTIONS FOR LOW-HEAD DEVELOPMENTS

each branch line and throttling down the flow by means of the two valves. This applies especially to the transformers, where otherwise large amounts of water would be wasted.

The basket strainers here shown differ from those in Fig. 1. There are several types on the market and all are good for freeing the water from leaves, sticks, etc. Where silt or sand is encountered, however, they would be of little use and a better water supply should be looked for ,and if this is not available a different method of cleansing the water must be resorted to.

De-aerating or Storage Tank

The storage tank shown in Fig. 3 is one of the simplest and most practicable methods of clearing excessively dirty water from sediment. This system is also resorted to where the transformers are fitted with iron cooling coils instead of brass and where it is therefore necessary to free the water from all air before it is allowed to enter the distributing headers, as otherwise the coils would be rapidly affected by corrosion. The tank is divided into two compartments and the water supply conducted into the smaller compartment, where all sand and silt settles to the bottom and the clear water spills over the top of the division wall into the storage compartment. This latter compartment is kept filled to the top, or nearly so, and the supply for the power house drawn from the bottom so that it will be seen that there is no chance for air to get into the distributing system.

In the case shown the requirements in the power house were 240 gal. per minute at a pressure of 25 lb. and a velocity of about 3 ft. per second. The tank was built to store a one-hour supply and was located at the proper elevation on the side of the hill to give the desired pressure. Connections for supply water to the tank were made to the penstocks at the power house and a cross-connection was installed with all the necessary cut-out valves and by-pass connections so that if at any time the supply from the tank failed water could be taken from the penstocks directly through a strainer into the distributing system. All valves were located at a convenient place in the power house where they could be quickly reached by the operator. The supply was controlled by an automatic float valve in the tank, the pressure in the penstocks at the power house being approximately 100 lb. The outlet pipe from the tank was fitted with a galvanized-iron strainer with a net area through the holes of the strainer equal to three times the net area of the pipe. The tank was fitted with a large drain from each compartment so that water could be run out from time to time and the impurities removed. It was also

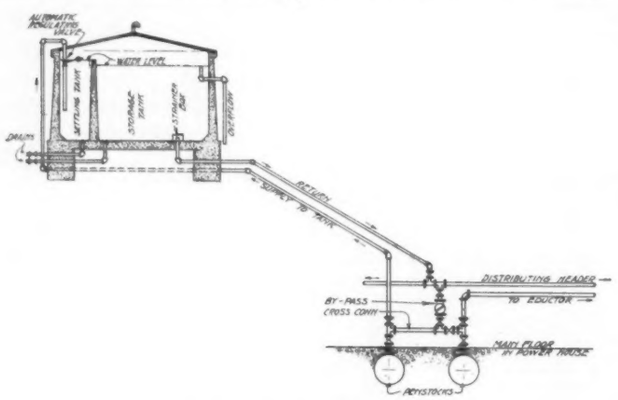


FIG. 3—STORAGE TANK

fitted with an overflow from the storage compartment and a device for registering the depth of water in the tank. It was built of concrete and covered with a roof on account of the more or less severe frosts.

This system is, of course, more expensive than the preceding ones on account of the cost of the tank, but in the above case it could not be avoided as the transformers had been ordered with iron coils and it was therefore necessary to free the water from air. The average cost of a tank of this kind is about 1.5 cents per gallon of water stored. Steel tanks are not desirable on account of requiring almost perpetual painting and scraping, while wood tanks

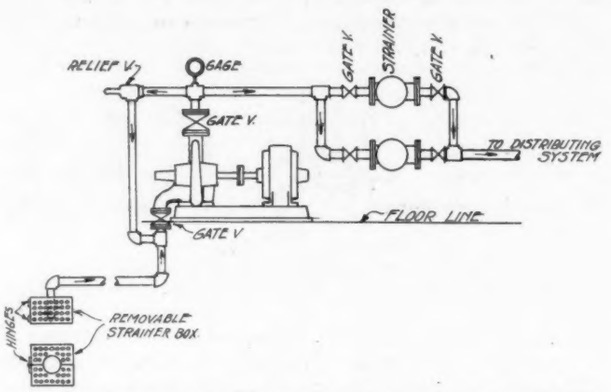


FIG. 4—TYPICAL ARRANGEMENT WHERE WATER IS PUMPED

are cheaper in first cost but their life not so long as that of the reinforced-concrete tanks.

Ponds and Reservoirs

Fig. 4 shows a typical arrangement where the water is pumped from a settling basin or storage reservoir. The piping details do not differ greatly from those previously described. The galvanized-iron strainer box at the intake end of the suction pipe should be made in two parts and hinged on one side so that it can be opened and removed for scraping and cleaning without disturbing the pipe. In order not to waste any water the discharge end of the pump is fitted with a pressure gage and relief valve, the overflow from the latter being piped back to the reservoir or the suction end of the pump. Basket strainers are used as before, but no connection has been provided for the eductor. With this pump there would scarcely be pressure enough to operate the eductor, and the work of cleaning out the sumps would have to be done by pumping exclusively.

Where water is taken from the city supply system the pump connections may be as shown in Fig. 4, but the strainer box will not be required. However, a Venturi meter or any other good type of meter must be installed complete with all the necessary recording mechanism. While any type of pump of sufficient capacity may be used, the general prevailing idea among engineers seems to be that where priming conditions are favorable and the lift is not too great a small centrifugal pump is the best to use, as it supplies all the water required at a very low pressure, and in that case the by-pass from the pump discharge back to the suction pipe may be omitted. While the sketch shows a motor-driven pump, a steam pump may be more desirable or more economical in certain cases.

Air-Gap Length of an Induction Motor

Kindly inform me whether increasing the air-gap length in an induction motor increases the watts input or merely increases the volt-amperes?
O. A. R.

The wattless component of the current taken by an induction motor increases almost directly as the length of the air-gap. The watts input is affected but little by a change in the air-gap. Thus if an ammeter and a wattmeter were connected in an induction motor circuit and an increase in air-gap was effected the ammeter would show an increased value of current, but there would be no appreciable increase in the reading of the wattmeter.

Digest of Current Electrical Literature

Abstracts of Important Original Articles Appearing in the Periodical Electrical Press of the World

Generators, Motors and Transformers

Self-Synchronizing Machines.—E. ROSENBERG.—An illustrated paper, in abstract, presented before the (British) Institution of Electrical Engineers. The scope of the synchronous motor, self-starting synchronous motors, rotary converters and methods of synchronizing are discussed. A new method introduced by the author allows self-synchronizing of a rotary converter with small armature current, prevents sparking on the brushes and prevents the reversal of the field of the rotary converter. A starting motor is connected in series with the slip-rings of the rotary converter. As a starting motor an ordinary squirrel-cage polyphase motor is nearly always used, but the explanation of the method is simplest by assuming a single-phase rotary converter and a single-phase commutator motor for starting (Fig. 1). There are no starting tappings on the main transformer. One low-voltage terminal *B* of the transformer is connected directly to one slip-ring *B* of the rotary converter, while the other terminal *A* has a straight connection through a single-pole main switch and another connection if the main switch is open through the single-phase starting motor. A small switch is shown in series with the single-phase motor, but is not essential. If the high-tension switch of the transformer and the switch of the starting motor are closed, the main low-tension switch being open, the current will flow through the starting motor into the rotary converter. The starting motor limits the current to a fraction of the full-load current of the rotary. The rotary armature represents very little impedance. The starting motor takes practically the full voltage of the transformer terminals, and as with a properly designed rotor this current of 30 per cent can produce a very good torque which is far in excess of the starting friction, it will start and bring the rotary up to speed very quickly. A current of this value is not sufficient to destroy the residual magnetism of the rotary converter. The field circuit of the rotary converter remains connected across the continuous-current brushes, and the rheostat is preferably put into such a position as to reduce the inserted resistance slightly below the value required for normal no-load excitation, as is done for instance with ordinary continuous-current shunt-wound machines in order to allow quick excitation. As soon as it approaches synchronism, the machine will, therefore, readily excite itself like any other continuous-current machine. Just before attaining synchronous speed the voltmeter will be violently agitated, but it becomes steady as soon as synchronism is reached. The voltage can now be adjusted and the starting motor short-circuited. Across the main low-tension switch an indicating lamp can be fitted, as shown in Fig. 1. This lamp will flicker before synchronism is reached and will be dark after the rotary has slipped into synchronism. When there is impressed on the slip-rings of a self-starting rotary converter an alternating-current voltage equal to 33 or 50 per cent of full voltage a flux of 33 or 50 per cent is created and the machine is excited from the armature with a number of ampere turns slightly less than 33 or 50 per cent of the normal field ampere turns. About nine-tenths of this magnetomotive force will be absorbed in the air-gap and the iron of the armature. One-tenth of it—that is, from 3 to 5 per cent of the normal field ampere turns—is consumed in the field iron. The coercive force of the field is smaller by 1 to 2 per cent, and therefore the magnetism of each pole will be reversed every time the rotary "slips a pole." If, on the other hand, a series-connected starting motor limits the voltage impressed on the rotary slip-rings to 6 per cent, the magnetomotive force impressed on the field is only about 0.5 per cent of the normal field ampere turns and is not able to reverse the residual magnetism, which represents from 1 to 2 per cent. An arrangement similar to that shown in Fig. 1 can be made for a three-phase rotary converter connected in series with a three-phase, squirrel-cage motor.—London *Electrician*, April 11, 1913.

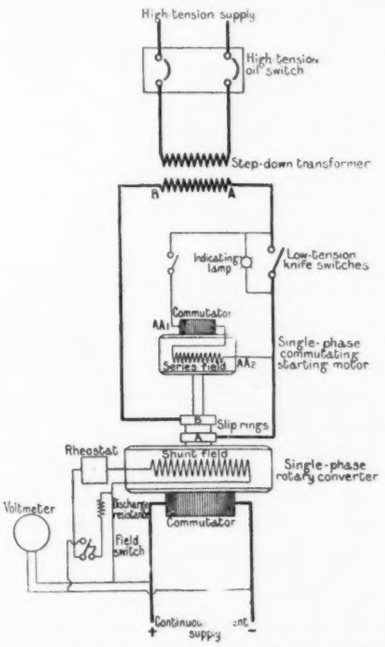


FIG. 1—DIAGRAM FOR SINGLE-PHASE ROTARY CONVERTER AND SINGLE-PHASE COMMUTATOR MOTOR

Three-Phase Series Motor.—LUDWIG BINDER.—An illustrated article in which the author first gives a diagram for the three-phase series commutator motor in the most simple connections. This diagram permits one to find quickly the relation between brush angle, stator voltage, rotor voltage, speed, torque current and phase difference. The diagram shows how the stability or lack of stability of the operation of the motor depends on the ratio of rotor turns to stator turns and indicates also the value this ratio should have in order to insure stability of operation. The author then takes up the discussion of the modified motor with a double set of brushes in which by means of displacement of the brushes the rotor turns are so adjusted that the condition for stability of operation is always fulfilled. A diagram is also given for this type of motor.—*Elek. Zeit.*, April 10, 1913.

Excitation of Direct-Current Machines.—E. J. BRUNSWICK.—An article illustrated by diagrams on a new method of predetermining the excitation of direct-current machines. The author shows that the usual method of estimating the total excitation is liable to give very erroneous

results. He establishes by analysis some essential principles which lead to a method which may be easily applied by designers and yields little-complicated curves and results which agree with the facts.—*La Lumière Elec.*, March 22, 1913.

Commutation.—L. Gratzmuller.—An outline of a new theory of commutation. Instead of trying to estimate the current density of the parasitic currents (the local currents in the brushes), the author calculates the potential differences between the segments under the brushes—potential differences which are produced by the currents which are intentionally circulated in the windings. If this potential difference has not more than a certain empirical value, no destructive parasitic currents will occur.—*La Lumière Elec.*, March 22, 1913.

Hunting.—C. P. Steinmetz.—An article in which the author explains the nature of synchronizing power and synchronizing force and shows that the hunting of a synchronous machine—a cumulative oscillation—is not a function of the synchronizing force, but is a true hysteresis effect, the result of a lag of the synchronizing force behind the position displacement which produces it. He draws an analogy between such electromechanical hunting and the purely mechanical hunting of a belt on its pulley and also states that a further analogy is provided by electromagnetic hunting in transformers and arcing grounds.—*Gen. Elec. Rev.*, May, 1913.

Synchronous Converters.—J. L. Burnham.—An article which contains a number of illustrations showing details of the latest construction of representative types of converters.—*Gen. Elec. Rev.*, May, 1913.

Generation, Transmission and Distribution

Automatic Attachment for Motor Starters.—A note on a recent British patent (No. 6599, 1912) of W. A. Clatworthy. To a pivoted lever are attached a weight or spring and a movable detent. A pivoted quadrant has a notch or projection for engaging the detent and is attached to the motor starter, of the ordinary non-automatic type, by a flexible coupling. A pivoted tripping arm is also provided for tripping and maintaining the detent in its non-engaging position. The pivoted lever and tripping arm are manually operated in one direction only. It is suggested that a suitable application of this gear would be to a hoist operated through fast and loose pulleys and where the starter may be operated for starting and stopping by unskilled persons from different floors by a rope.—London *Elec. Eng'ing*, April 10, 1913.

Power House.—The first part of an illustrated description of the new central power house in the Staffordshire potteries district, which gives a supply to the federated towns of Burslem, Hanley, Longton and Stoke and the districts of Tunstall and Fenton. For the new power house three-phase high-tension generation and transmission was decided upon. Use will be made of rotaries and motor-converters in the substations. The article is to be concluded.—London *Electrician*, April 11, 1913.

Dangerous Rises of Voltage.—M. Gierlich.—The first part of a paper read before the Niederrhein Electrical Society on protection apparatus used by the municipal electric station of Neuss. The author describes the different ways in which dangerously high voltages may occur on transmission lines and then begins to discuss the different protection devices. The article is to be concluded.—*Elek. Zeit.*, April 10, 1913.

Traction

Single-Phase Traction Motors.—Marius Latour.—An article giving comparative notes on the different single-phase commutator motors which have been tried in the tests of the Compagnie des Chemins de fer du Midi in France. The motor types experimented with comprised the Westinghouse series motor, the simple repulsion motor (Brown, Boveri & Company), the compensated-repulsion motor (Allgemeine Elektricitäts Gesellschaft), the series motor with space-quadrature and time-quadrature local field for compensating the emf of short-circuit under the brushes (Jeumont), and the series motor with elliptic field (French Thomson-Houston Company). After giving notes on the characteristic features of these different types the author compares them with respect to the value of the sliding surface of the brushes in contact with the commutator and with respect to weight. The author insists upon the superiority of the series motor with local commutation field for a frequency of 15 cycles but thinks that the repulsion motors and especially the compensated repulsion motor are to be preferred at higher frequencies. The selection of the type of motor to be employed is, therefore, intimately connected with the numerical value of the frequency.—*La Lumière Elec.*, April 5, 1913.

Installations, Systems and Appliances

Swedish Central-Station Statistics.—R. Naucler.—Statistical data on the condition of central stations in Sweden in 1910. The stations are divided into two classes. The first comprises the pure power plants (all of them being water-power plants) and their number is twenty-one. Some figures about the five most important of these plants are given in the following table, in which the first column of figures gives the equipment rating in kilowatts in 1909, the second the rating in 1910, and the third the length of the transmission lines in miles:

DATA ON SWEDISH CENTRAL STATIONS

	1909, Kw	1910, Kw	Miles
Trollhättan	840	29,400	185
Guldspang	11,560	12,500	96
Yngeredsfors	7,383	7,383	77
Hemsjö	5,650	5,650	76
Dejefors and Frykfors	3,600	4,000	53

The ratio of maximum load to total rating of connections varied in most of the plants between 0.47 and 0.75. The ratio of the yearly total production in kilowatt-hours to the maximum load of the station in kilowatts varied between 1767 and 5220 hours. The mean annual load of the different stations averaged about 50 per cent of the maximum load. The total first cost, including land, hydraulic developments, buildings, transmission lines and motors, varies between $150 and $242.50 per kw of rating. The cost of operation, without interest and amortization, is, with one exception, below 0.25 cent per kw-hr. The lowest cost is 0.08 cent. The annual receipts per kilowatt connected average $17.50. The second class of works described are those which distribute electrical energy for lighting, motor service and traction. They have either their own generating plants or buy the energy in bulk from plants or combine both methods. In 1910 there were sixty-five such plants, of which thirty-five were owned by municipalities and thirty by private parties or corporations. Fifty supplied energy for lighting and motor service, fourteen for lighting, motor service and traction and one for traction alone. Twenty-four used direct current, nineteen alternating current, and twenty-two a mixed direct-current and alternating-current system. Numerous data are given for these plants concerning connections per inhabitant, maximum load, first cost, receipts, etc.—*Elek. Zeit.*, April 10, 1913.

Current-Limiting Devices.—J. B. Picot.—An illustrated article on the different limiting devices which have come into use during recent years in systems in which a flat rate is charged and the consumer is disconnected (or at least warned by a flickering of the lamps) as soon as he consumes more power than he is permitted to do. The author

refers to the disadvantages of devices in which use is made of mercury or a hot wire and states that electromagnetic devices are to be preferred. Two such devices are described in detail, one of which is shown in Fig. 2. The interrupter has two pieces of carbon, one, *A*, being fixed and the other, *B*, being movable and mounted at the end of the lever *L*, which can rotate around the axle *O*. Under normal circumstances the two carbons *A* and *B* are in contact. Between the lever *L* and the piece of soft iron *D* an electromagnet *C* is provided which is excited by the current in the line and which attracts the soft-iron piece *D*

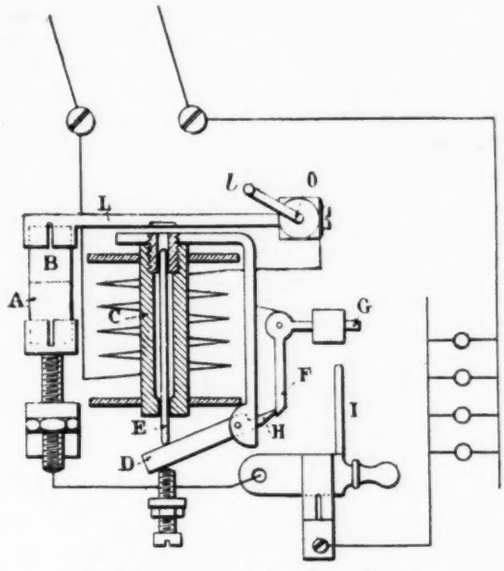


FIG. 2—CURRENT-LIMITING DEVICE

when the current used rises above a certain value. The soft-iron piece *D* pushes the rod *E* upward in the hollow center of the core of the electromagnet against the lever *L*, thus breaking the contact between the carbons *A* and *B* whereby the main circuit is broken. When *D* is attracted upward the lever arrangement *F G* begins to oscillate and prevents the soft-iron piece *D* from coming back into its former position until the load is reduced below its permissible value, when the circuit may be closed again by means of the hand-operated switch *I*.—*La Lumière Elec.*, April 12, 1913.

Regulation of Distributing Systems.—A note on a recent British patent (No. 6212, 1912) of the British Thomson-Houston Company and the General Electric Company of this country. As applied to a three-wire system each dynamo or balancer has in the field circuit a resistance which is short-circuited through a relay controlled by another relay with two balancer windings, one across each outer and the neutral. It is thus arranged that one resistance is in circuit while the other is out, so that rapid following of load variations is possible.—London *Elec. Eng'ing*, April 10, 1913.

German Central Stations.—G. SIEGEL.—A paper giving data on the importance of the electric central stations in the economic life of Germany. Numerous statistical tables and curves are given.—*A. E. G. Revue Mens.*, March, 1913; abstracted in *La Lumière Elec.*, April 5, 1913.

Arcing of High-Tension Switches.—W. HOEPP.—An English translation in abstract of his recent German paper on arcing phenomena on high-tension switches.—London *Electrician*, April 11, 1913.

Electric Heaters.—H. O. SWOBODA.—An illustrated article on the different typical devices used as electric heaters and utilizing either the Joulean effect, the electric arc or the electric spark.—*Elec. Jour.*, April, 1913.

Switchboards.—C. H. SANDERSON.—A continuation of his illustrated article on remote mechanically controlled switchboards in alternating-current power stations.—*Elec. Jour.*, April, 1913.

Wires, Wiring and Conduits

Protection of High-Tension Feeders.—An anonymous article in which it is emphasized that the continuity and reliability of supply is better assured with a system of many small substations in series than with a system of a small number of large substations. It is necessary to use circuit-breakers which do not operate in the case of an overload but open in the case of an accidental ground on the system.—*La Lumière Elec.*, April 12, 1913.

Theorem of Reciprocity in Electric Networks.—A brief mathematical paper by H. A. W. Klinkhamer on the reciprocal coefficients in electric networks. Some critical remarks on the mathematical conclusiveness of the author's proof are added by F. Breisig.—*La Lumière Elec.*, March 29, 1913.

Repairs of Fuses.—P. H. PERLS.—A note emphasizing again the fact brought out before in several official reports that repaired fuses are not only uneconomical but may be dangerous. A properly repaired fuse is not cheaper than a new one and the endeavor should be to use only new fuses.—*Elek. Zeit.*, April 10, 1913.

Slide Rule.—ERWIN BESSER.—The author describes a new slide rule which permits one to make in a very simple manner the common calculations of electric lines with respect to voltage drop and cost and also to make multiplications and divisions in the same way as with the ordinary slide rule.—*Elek. Zeit.*, April 10, 1913.

Units, Measurements and Instruments

Measurements of Inductance.—A. O. ALLEN.—In a report to the British Association in 1883 it was pointed out by Lord Rayleigh that there is a marked difference in the behavior of a galvanometer used for null methods of inductance measurements according to whether the balance is continuous or merely aggregate. The latter case, of course, tends to give unsteadiness. The report discusses a particular case and shows that two conditions must be fulfilled if the balance is to be continuous, but no proof is given that these are sufficient (as they are), and yet it might at first be supposed that there would be others; for the expression for the quantity passing along any arm of the network consists in general of four terms, each of which must in the galvanometer arm be identically equal to zero for a continuous balance. Moreover, no general method is indicated for discovering the necessary and sufficient conditions in other cases, if there are such conditions. Lastly, it seems that in the cases where there is not a continuous balance it would be useful to know roughly the duration of the flow through the galvanometer in the two directions successively, so as to judge whether the instrument is sufficiently ballistic. These matters form the subject of the author's discussion, and most of the ordinary laboratory methods are dealt with. The author discusses Maxwell's original plan for comparing an inductance with a capacity, Rimington's method, Niven's method, W. Stroud's method, Anderson's method, Carey Foster's comparison of mutual inductance with capacity, Maxwell's method of comparing two *M*'s, Maxwell's method of comparing the *M* of two coils with the *L* of one of them, Brilloni's method, and Niven's method of comparing the *M* of two coils with the *L* of the third. In five of the twelve methods considered a continuous balance is of necessity attained, if a balance is attained at all; in four such a balance cannot possibly occur, and in only three is the continuous balance dependent upon conditions. Moreover, in these three cases it can only be realized by introducing a double adjustment, a thing which is usually regarded as fatal to the practical utility of any method. The advice to "fulfil the condition for a continuous balance when

such a condition exists" may well be supplemented by further advice to choose a method (when possible) in which no special condition need be fulfilled. This is the case in three methods, namely, W. Stroud's method and Anderson's method of comparing an inductance with a capacity and Maxwell's method of comparing the *M* of two coils with the *L* of one of them. The paper is highly mathematical.—*Philos. Mag.*, April, 1913.

Electric Dynamometer in the Automobile Industry.—Carl F. Scott.—An illustrated article in which the author explains the principle of the electric dynamometer and enumerates its marked advantages in the testing of all types of gasoline engines, describes its construction, shows how the readings of torque and speed are obtained, explains the control system and the method of absorbing the load, and describes the procedure for conducting the tests on the engine. The latter part of the article deals with the chassis-testing electric dynamometer, and a summary of the reasons why the automobile factories are finding that this method of testing chassis pays—a method in which the tire bill is eliminated, labor costs are reduced, whole-time operation of men and plant is made possible and economies are effected which quickly outrun the entire costs of the complete electrical equipment.—*Gen. Elec. Rev.*, May, 1913.

Sphere-Gap as a Means of Measuring High Voltage.—F. W. Peek, Jr.—An illustrated article in which the author shows that by using spheres for the electrodes of spark-gaps much more consistent results are obtained than with the present extensively used needle-gap. Correctly proportioned sphere-gaps are not nearly so sensitive to the modifying effects of varying degrees of humidity; there is no corona formation preceding spark-over, and consequently no heating of the air by the streamers; the space-factor is smaller, while several thousand measurements can be made before repolishing becomes necessary. The results of some calculations and tests on gaps formed between spheres of different size are shown in the shape of curves. A few simple formulas are given to assist in calculating special cases.—*Gen. Elec. Rev.*, May, 1913.

Telegraphy, Telephony and Signals

Trunk Telephone Transmission.—A. B. Hart and W. J. Hilyer.—A paper, in abstract, read before the (British) Institution of Post Office Electrical Engineers, discussing standards of reference for speech and transmission, best distribution of copper in line circuits, effects of loading and losses, the design of a transmission scheme, trunk-circuit design, simultaneous telephone and telegraph working, long-distance work and communication between England and continental Europe.—London *Electrician*, April 11, 1913.

Submarine Cable Signaling.—H. W. Malcolm.—The first part of an article illustrated by diagrams on a comparison of the methods of submarine cable signaling. To provide a quantitative test of the relative merits of different methods of signaling in submarine cables, a standard word is supposed sent through a representative cable, and its shape as received is calculated. The methods of signaling considered are: (a) siphon recorder code, (b) ordinary Morse code, (c) the Gott form of Morse, and (d) the Picard form of Morse. The shape of the received word is illustrated graphically, and the effect of various modifications in the sending conditions is discussed.—London *Electrician*, April 11, 1913.

Miscellaneous

German Electrical Industries.—The conclusion of the series of reviews of the German electrical industries in 1912. A. Schnée discusses electrotherapeutics and the uses of Roentgen rays, Schwerin discusses electric signals, Berger telegraphy and telephony over wires, O. Jentsch wireless telegraphy and telephony. The report of the German government telegraph and telephone department for 1912 is added.—*Elek. Zeit.*, April 10, 1913.

Thefts of Electricity.—E. de Longueval.—An article describing several clever devices by which fraud has been committed in France in changing the meter readings so as to reduce the bill for energy consumed. The article is illustrated by diagrams.—*La Lumière Elec.*, March 29, 1913.

Organization.—C. B. Auel.—A lecture on the formation and organization of a large manufacturing corporation, giving in diagrams a scheme of such an organization, a sample balance sheet and a sample income and profit and loss statement.—*Elec. Jour.*, April, 1913.

Economics of Engineering.—W. A. J. O'Meara.—A long abstract of a lecture to the students of Faraday House on the economics of policy and the economics of practice making up the science of engineering economics. The subject is discussed under the following four headings: Markets; methods of management of engineering enterprises and the technical details relating thereto; diversity of interests of employers and employed; effects of legislation on engineering enterprises—London *Electrician*, April 4, 1913.

Engineer in Charge.—A. E. Penn.—An abstract of a paper read before the (British) Association of Engineers in Charge on the province of the engineer in charge.—London *Electrician*, April 4, 1913.

Book Reviews

Hygiene for the Worker. By William T. Tolman, Ph. D., and Adelaide Wood Guthrie. Edited by C. Ward Crampton, M.D. New York: American Book Company. 225 pages, illus. Price, 50 cents.

A very practical and clearly written book intended especially for the reading of boys and girls from thirteen to eighteen years old. It contains much useful information both as to the regulation of normal life and also as to how to act in an emergency. It is easy to read and is well illustrated. In our opinion too much stress is laid on what the worker should expect from his employer and too little on what an employer should expect from his employee; but if this is a well-founded criticism, it is only fair to add that any such one-sidedness of advice is apparently unintentional. The book will interest many persons outside of the youthful members of society for whose particular benefit it has been prepared.

Die Veranschlagung Elektrischer Licht- und Kraftanlagen unter Benutzung vorgedruckter Formulare. Für die Praxis erläutert von Oberingenieur. By B. Jacobi. Munich and Berlin: R. Oldenbourg. 207 pages. Price, 7 marks.

In the progress of electrical engineering we begin with scientific discovery and advance through the work of physicists and inventors to the activities of the constructing, installing and operating engineers. When the work becomes so far advanced that the operating engineer, the last member of the series, standardizes it the question of costs and accounting becomes important. Unless standard methods of accounting are followed, comparisons between different sets of accounts are ambiguous and unreliable. The book written by Mr. Jacobi presents a standard system of accounting and cost sheets for plants and stations whereby the machinery, apparatus, wiring and materials may be tabulated and itemized conveniently and to the best advantage. Twenty schedules are set up and analyzed relating to direct-current and alternating-current generators and stations, transformers, storage batteries, lightning arresters, conducting systems, motors of various types, lamps of various types and converters. The work will appeal to manufacturers, central-station engineers and accountants interested in German methods.

New Apparatus and Appliances

An Illustrated Descriptive Record of Recently Developed Manufactured Products of Interest to Electrical Readers

Interchangeable Socket

The illustration shown herewith represents a keyless socket embodying the interchangeable feature. This socket is fitted with a groove which permits it to be used with shade holders and is equipped with a ⅜-in. aluminum cap at the top. The manufacturers of this socket have recently put upon the market a line consisting of fifteen standard parts from which it is possible to make twenty-four different combination sockets and receptacles both with and without keys. The interchangeable feature permits the jobber to carry in his stock a variety of sockets and receptacles without the outlay of a great deal of capital. These sockets are manufactured by Pass & Seymour, Inc., Solvay, N. Y.

INTERCHANGEABLE SOCKET

Chain-Pull Attachments for Lamp Sockets

The firm of Harvey Hubbell, Inc., Bridgeport, Conn., has just placed on the market a pull socket with a permanent chain-pull attachment and also an attachment for ordinary pull sockets, the two devices being shown in Figs. 1 and 2 respectively. The construction of the former is evident from the illustration. The latter can be attached directly to any pull socket. A stiff spring band is clasped around the socket. A slot in the end of the band hooks over a screw which tightens the attachment. When properly fastened it cannot wabble, bend or get out of order. The chain is connected to the end of the curved lever, which comes directly opposite the chain eyelet. The downward pull of the cord effects a forward pull of the chain. There is no strain on the socket or chain and the lamp is free from harmful jarring.

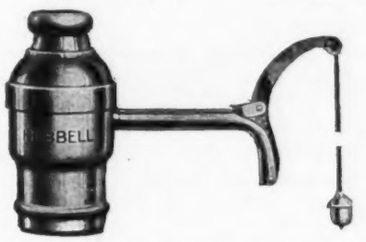


FIG. 1—CHAIN-PULL ATTACHMENT FOR BARE SOCKET

FIG. 2—CHAIN-PULL ATTACHMENT FOR SHADED LAMP

Semi-Indirect Lighting Fixture

The fixture illustrated herewith, called the "Phoenixlite," is simple and efficient and, according to the manufacturer, it absolutely eliminates glare. The lamp is totally concealed and the quality of the glass is such as to produce a daylight effect. In using this fixture the color and other conditions at the ceiling are said to be immaterial. The reflector is easily kept clean, consequently efficiency of the installation is maintained.

SEMI-INDIRECT FIXTURE

This fixture is manufactured by the Phoenix Glass Company, 15 Murray Street, New York.

Severe Test of Motor in Dayton Flood

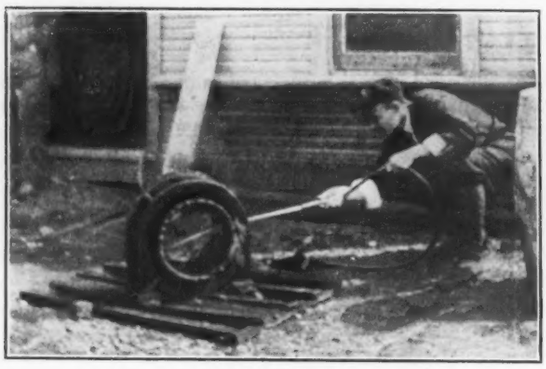
BY L. T. RAINEY

In the recent flood at Dayton, Ohio, electrical apparatus installed in central stations, as well as in industrial plants, received a test for which they were never designed. Many interesting tales have been reported of electrical apparatus salvaged from this flood, bearing witness to the sturdiness of modern machinery.

One interesting case concerned a 5-hp, 900-r.p.m., 220-volt, 60-cycle motor made by the General Electric Company. This motor is of the internal-resistance type, with self-contained starting switch. The motor had been loaned to the customer, the Workingmen's Laundry Company, by the Dayton Lighting Company two weeks before the flood. The building in which this motor was installed was inundated to a depth of 15 ft., the motor being totally submerged and full of mud and silt for two weeks. On examination it was found that the oil in the bearings had thoroughly protected them against rust and that the internal starting switch had effectively blocked both ends of the rotor so that there was no sediment inside of it. In one hour from the time of inspection the motor had been thoroughly cleaned with a hose and water, in the manner shown in the illustration, and was placed in service and running light. There were no means at hand to dry out the motor, so it was deemed advisable to apply current and

let the motor dry itself out. This was accomplished by connecting it directly to the line, the starting resistance first being entirely cut out of circuit by means of the internal switch. For a moment the rotor threw out water like a miniature waterwheel, but it soon settled down to normal operation, without causing trouble.

The age and previous condition of service of this motor



WASHING SILT FROM MOTOR

make its performance most interesting. On investigation it was found that the motor was ten years old, it having been purchased by the Dayton Lighting Company in 1903. It had been previously used by that company in making all sorts of operating tests in various industrial plants for extended periods and had been subjected, in consequence, to severe overloads and treatment.

A Compact Condensing Plant

A compact surface-condensing plant, consisting of a surface condenser with turbine-driven air, circulating and hot-well pumps, has recently been built by the C. H. Wheeler Manufacturing Company, Philadelphia, Pa., to operate in conjunction with a 3500-kw Westinghouse-Parsons turbo-generator. The condenser illustrated herewith contains 13,500 sq. ft. of tube surface made up of seamless drawn brass tubes 18 ft. 2 in. long, secured by ferrules at both ends and rolled into Muntz metal-tube sheets. The condenser is of the two-pass type arranged for full counter-current operation. The exhaust steam enters at the bottom of the shell through a 48-in. exhaust inlet and passes upward on the outside of the tubes toward the air-pump suction, which is at the highest point of the shell. The water, entering at the top, travels along the top bank of tubes, then reverses and passes through the middle bank of the tubes, and then through the bottom bank

FIG. 1—SURFACE CONDENSER

of tubes and out at the 24-in. opening on the bottom of the water box. At the under side of the condenser shell is provided a hot-well chamber in which condensed steam collects to be removed by the hot-well pump.

Fig. 2 shows the pump combination. It is in this arrangement of the air, circulating and hot-well pumps that the special features of the equipment are involved. The unit consists of a 20-in. high-speed low-head centrifugal entrainment-type air pump and a two-stage centrifugal hot-well pump. The entire combination is driven by a 125-hp Terry steam turbine of special design. The condensing equipment will handle 60,000 lb. of exhaust steam per hour and produce a vacuum of 2.25 in. absolute with circulating water available at 85 deg. Fahr. This condi-

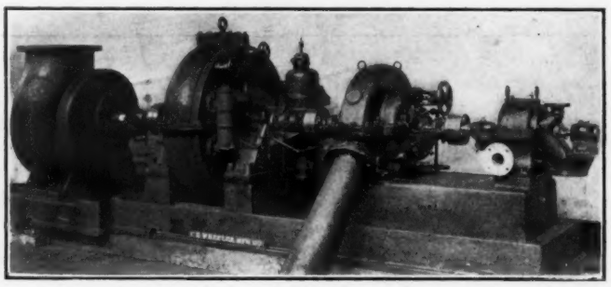


FIG. 2—TURBINES AND PUMPS

tion is equivalent to a vacuum of a little better than 1.5 in. absolute with a normal temperature of 70 deg.

The normal speed of the combined pump unit is 1450 r.p.m. This speed, however, can be varied by adjusting the governor of the turbine to suit varying water temperatures and take care of heavy overloads.

The Sturdy Vehicle Battery

Interesting stories are coming in from the territory swept by the recent cyclone and floods, and all show the great recuperative powers of the electrical interests. A remarkable example of the sturdiness of electric-vehicle equipment was discovered in the ruins of the Omaha Electric Garage. A Detroit electric roadster owned by the Omaha Electric Light & Power Company was buried under tons of brick and wreckage, and when the debris was cleared away a cable was attached to the front axle and it was hauled out.

The car contained a battery of forty Edison alkaline cells. The forward metal hood over the battery had been crushed in, short-circuiting the cells and burning off the

WRECKED ELECTRIC VEHICLE

connecting jumper cables, but the cells themselves appeared to be uninjured. Later a test was made by taking individual cell readings, and it was found that neither the weight of the falling wall and short-circuiting nor the subsequent storage of the battery had damaged a single cell. Even the electrolyte was found at practically its normal level.

Indirect Illumination of Salesroom

The Firestone Tire & Rubber Company, Chicago, has recently had its salesrooms and offices equipped with so-called Alexalite lighting fixtures made by the Central Electric Company, 320 South Fifth Avenue, Chicago.

Ten such fixtures fitted with 250-watt lamps are installed

SALESROOM WITH INDIRECT LIGHTING

in the salesroom shown in the illustration. An effective illumination of 4 ft.-candles is said to be obtained at a consumption of 0.66 watt per square foot. In this connection it should be noted that the interior decorations are in fumed oak, which is a poor reflecting medium. Shadows are said to be entirely eliminated below the fixtures. In this case the brightest spot is said to be directly beneath the bowl. The excellent light distribution is credited to the design of the diffuser bowl and the fact that the diffusing medium is porcelain-enameled steel.

Vertical Motor for Cement Mills

In order to provide a thoroughly satisfactory drive for vertical machinery such as grinders and pulverizers in cement mills and other places where the service is very severe, the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has built a line of vertical motors in sizes varying from 75 hp to 200 hp for both direct-current and alternating-current service.

FIG. 1—VERTICAL CEMENT-MILL MOTOR

A special feature of this motor is its strong, rugged construction. The motor frame is supported by a massive cast-iron base, which rests on slide rails with belt-adjusting screws. The shaft is of very large proportions and the bearings are designed to withstand severe stresses. The weight of the motor and the major part of the horizontal thrust due to belt tension are carried by a ball bearing mounted within the motor base. This bearing is housed in an iron case and can easily be removed if the necessity arises. The bearings are automatically oiled, the oil being

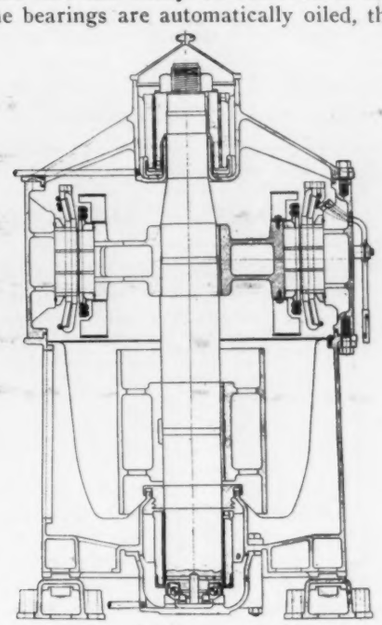


FIG. 2—SECTION THROUGH CEMENT-MILL MOTOR

forced between the bearing surfaces whenever the motor is in motion. The ball thrust bearing runs immersed in oil. The commutation of the direct-current motors is said to be practically sparkless.

Emergency Motor-Driven Pumps for Theaters

Notable electrically driven equipments of fire-fighting apparatus are installed in the Alhambra Theater, New York City and the Orpheum Theater, Brooklyn. The illustration shows one of these duplicate sets which consists of a 25-hp, 1000-r.p.m. motor manufactured by the Diehl Manufacturing Company, Elizabeth, N. J., and the Douglas duplex pump manufactured by W. & B. Douglas, Middletown, Conn. The motor is fitted with a special form of automatic controller which places the pump in service at a moment's notice. These outfits are used to maintain

MOTOR AND PUMP FOR FIRE-FIGHTING

pressure in the fire lines for emergency use. They deliver 250 gal. of water per minute, operating at 50 r.p.m. against a pressure of 100 lb. per sq. in.

Motor Equipment of a Cigar-Box Factory

The modern cigar-box factory includes, besides the woodworking machinery, also presses for printing of trade-marks and names, bronzing and embossing. In the plant of the C. B. Henschel Manufacturing Company, Milwaukee, there are fifteen presses for such purposes and a total of twenty polyphase induction motors, all but one driving a separate machine or press. The motor excepted, rated at 15 hp, is part of the original equipment and drives seven small presses, six nailing machines, five circular saws and a freight elevator. It is planned to split up this large group as it is often necessary to run this motor when only a few of the machines are operated.

MOTOR EQUIPMENT OF CIGAR-BOX FACTORY

Number	Rating in Hp.	Type	Application
1	15	Slip-ring	Operating elevator; motor suspended from ceiling.
1	3	Squirrel-cage	Driving paper cutter; motor mounted on floor.
1	1	Squirrel-cage	Driving bailing press; motor mounted on wall bracket.
2	0.5	Slip-ring	Driving small job presses; speed control by means of circular-plate speed regulators mounted on wall; motors on floor.
1	2	Slip-ring	Driving embossing press; drum-type speed controller mounted on press; motor on floor behind press.
1	2	Slip-ring	Driving pony flat-bed press; face-plate-type speed regulator mounted on wall next to press; motor on floor.
1	3	Squirrel-cage	Driving bronzing press; motor under press on floor.
1	5	Slip-ring	Driving a flat-bed press; drum-type controller mounted on press; motor on floor.
2	3	Slip-ring	Driving small flat-bed press; drum-type controllers mounted on presses; motors on floor.
1	0.5	Squirrel-cage	Driving small circular saw used for trimming cuts, etc.; motor on floor.
1	0.5	Squirrel cage	Driving emery wheel and buffer.
1	0.5	Squirrel-cage	Driving small circular saw.
2	5	Squirrel-cage	Driving 30-in. planer; motors on floor, inclosed in boxing.
1	2	Squirrel-cage	Driving paper cutter; motor on floor.
1	0.25	Squirrel-cage	Driving gluing machine and belt.
1	10	Slip-ring	Blower system.
1	15	Slip-ring	Driving group of seven small presses, six nailing machines, three circular saws, freight elevator and two circular saws on floor above; motor located in old section of plant.

The wood when purchased from the mills is a little thicker than that used for the boxes and is run through a 30-in. planer driven by 5-hp squirrel-cage motors. The wood is then cut in lengths and widths to suit the requirements, most of the boxes being a standard size.

In the basement there are fourteen motors. Three flat-bed presses are operated by slip-ring-type motors, controlled by drum-type controllers. A bronzing press run at a slow speed is driven by a 1-hp back-geared squirrel-cage motor, with the starter mounted on the frame. A small gluing machine for applying glue to the paper lining is driven by a 0.25-hp motor. This machine consists of several rolls, one of which runs in glue kept in a liquid state by means of a steam coil. Glue is applied to one side of the labels and lining by passing the sheet between the upper rolls, whence it is carried on an endless belt between two tables where it is picked up and applied.

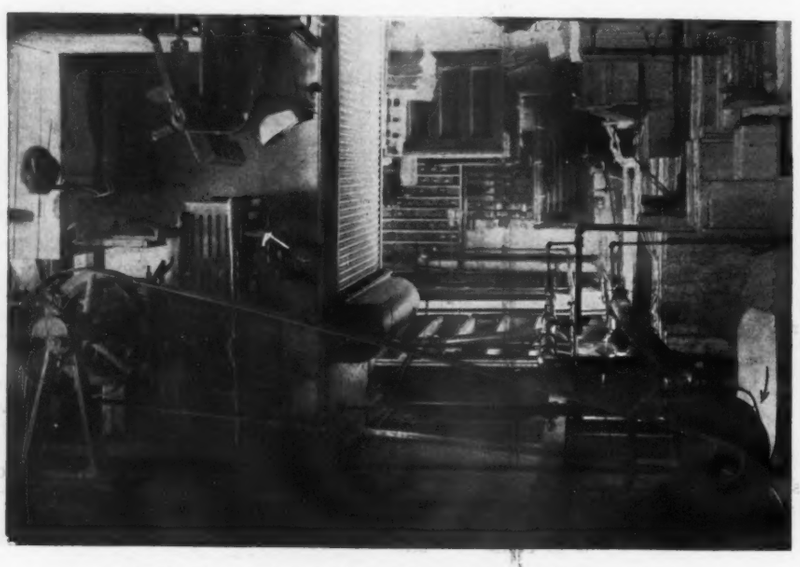
The total rating of the motors in use is 76¾ hp, and energy for them is furnished by a 28.8-kva, 240-volt generator. A service connection to the lines of The Milwaukee Electric Railway & Light Company is installed for supplying energy in emergency cases. Three-phase, 60-cycle Watson motors, made by the Mechanical Appliance Company, Milwaukee, are used in the plant.

Oil-Pressure Bearings for Large Turbo-Generators

The power plant of the Mississippi River Power Company now in course of construction at Keokuk, Ia., will ultimately contain thirty 10,000-hp generating units. At the maximum head of 39 ft. the output will be approximately 14,000 hp per unit. The waterwheels are of the single-runner type operating at 57.7 r.p.m. They are directly connected to vertical, low-speed generators. The turbines are the largest ever built.

The thrust bearings are a combination roller and oil-pressure bearing. As the total weight of the unit which each of these bearings has to support is 275 tons, the importance of the oil supply is very apparent. The oil is pumped to the bearings by means of triplex pressure pumps made by the Goulds Manufacturing Company, Seneca Falls, N. Y. It is supplied at a pressure of 250 lb. per sq. in., which is sufficient to lift the unit so that it floats on the oil and relieves the rollers of the load.

The pumps have 6½-in. cylinders and 8-in. stroke. They are operated by chain drive from a line shafting.



INTERIOR OF CIGAR-BOX FACTORY, SHOWING MOTOR DRIVE

TRIPLEX PRESSURE PUMP

Industrial and Financial News

Public Utility, Commercial, Corporate and Trade Developments—The Electrical Material and Security Markets

Found Oil Engines in Demand Abroad.—W. R. Haynie, 30 Church Street, New York, who is the United States representative of Carels Fréres, the well-known builders of Diesel oil engines at Ghent, Belgium, upon his return from Europe this week, said to a representative of the *Electrical World* that during his trip he found that great interest is being shown throughout Europe in the Diesel engine and that all of the many companies building this type of engine are exceedingly busy. "One very impressive feature of the Diesel engine field abroad," he said, "is the large extent to which this engine is being manufactured in countries in which no oil is produced. Nevertheless, all of the larger engine builders and manufacturers of power-plant equipment are building Diesel engines of some size and type; all are very prosperous and are from eight to sixteen months behind in filling their contracts for Diesel engines. In many cases the greater percentage of the output of these manufacturing plants, which formerly built steam or gas engines, is now Diesel engines in units varying from 50 hp to 3000 hp in rating. In the majority of cases abroad nowadays the central-station managers, municipal authorities and heads of manufacturing industries do not buy power-station equipment without first considering the Diesel engine, using either crude petroleum, residue oils or coal-tar oils. In the greater number of instances, and particularly in the case of the foreign central-station companies, the final selection is the Diesel type of engine. The installation of a 1000-hp two-cylcle Carels-Diesel engine in the Brussels central station, to be used to help the turbine equipment carry the peak load, is an example of one of the uses of the crude-oil engine abroad. Oftentimes the Diesel engines are used to carry all of the very light loads in the latter part of the night. Very large central stations that are being built in Havre, Bucharest, Lucerne and various other European cities to-day will undoubtedly contain Diesel units. One of the European governments, after a very exhaustive study, has decided to purchase forty-six Diesel engine generating sets for fortification work. It is also very interesting to see in England that some of the largest industrial plants, such as the Daimler Motor Company, the Hoffman Manufacturing Company and others, have Diesel engine power plants varying from 1000 hp to 3000 hp and use fuel oil which costs them 7½ cents per gallon, net, delivered in their storage tanks, when they could buy coal delivered in the boiler room at $3.25 per ton."

The Tariff and Business Conditions.—While there is some apprehension in certain quarters concerning the effect on business of the proposed changes in tariff rates, the general sentiment in various branches of the electrical and allied industries seems to be that no changes of a radical nature are impending and that such changes as are imminent will not affect business greatly. What dissatisfaction there is in evidence seems to be among the smaller concerns and is in all probability traceable to purely local conditions. The larger companies say, almost without exception, either that their sales are increasing or that they are steady and satisfactory in volume. The general impression gained from large dealers in various lines is that competition has been pretty severe and that, while sales have been large in volume, prices have inclined to vary considerably. A prominent firm of mica importers, when interviewed, expressed the opinion that the proposed tariff rates on mica would not materially affect the industry. They thought that the lower grades costing under $1 per lb. and unfabricated mica would be affected favorably and that the higher priced grades and formed mica would be hurt by these changes. If anything, they said, the manufacturer of built-up mica plate would be a little benefited at the expense of the importer, but the difference would be small. Several of the leading makers of insulated wire and cable join in the opinion that the proposed rubber rates would have little effect on the electrical industry one way or the other. The amounts used are so comparatively small and speculation is so active that they feel the tariff is a matter of secondary importance.

Activity Continues in Ornamental Lighting-Pole Business.—"We have had one of our most successful seasons thus far," said the manager of a well-known ornamental lighting-pole company this week, "and one very surprising thing is the high rate of activity in our business at the present time. Ordinarily things begin to slacken up at this season of the year, but so far there has been no let-up in the volume of orders and inquiries. That there is a widespread interest in ornamental standards is indicated by the large amount of equipment we are selling in all parts of this country and elsewhere. During the past month we shipped a great many standards to Panama, Santo Domingo and Canada in addition to filling many orders from people in this country. I dare say that there is hardly a town of any magnitude in the country where electric service is available in which the question of installing an ornamental lighting system has not been considered. Civic improvement associations are continually asking us for information. Only recently I had a request from a religious federation for advice along the line of ornamental street-lighting systems. This association works in connection with a number of welfare agencies in the various towns and cities in a certain state and is preparing and working on plans for community betterment. One of the subjects it is studying very carefully in this connection is that of street lighting as a deterrent to crime and an aid to business expansion. In view of the rapidly growing interest shown in better lighting, I look forward to maintenance of the excellent conditions in our line."

Reduction in Price of Carbon Lamps.—Manufacturers of incandescent lamps recently placed in effect a new price schedule for carbon-filament lamps. The regular 20, 25, 30, 50 and 60-watt, 100-130 volt lamps, with specific consumptions of 4.15, 3.10, 3.25, 3 and 3 watts per candle respectively, are now listed at 12 cents plain and 14½ cents frosted, in standard package quantities of 250, subject to a discount of 15 per cent on standard package quantities. The regular 100-watt and 120-watt, 100-130 volt lamps having specific consumptions of 3 watts per candle are listed at 18 cents plain and 21 cents frosted in standard package quantities of 175, subject to the same discount. The 10-watt and 20-watt, 100-130 volt sign lamps, having specific consumptions of 5 watts and 4.15 watts per candle respectively, are listed at 12 cents plain and 14½ cents frosted, and the 64-watt, 100-130 volt street-railway type lamp, having a specific consumption of 4 watts per candle, is also listed at the same prices. On 35-watt and 60-watt, 200-275 volt lamps, with specific consumptions of 4.4 watts and 3.7 watts respectively, the list price for standard package quantities of 250 is 14 cents plain and 16½ cents frosted. For the 120-watt lamp of the same voltage and specific consumption the price plain is 24 cents and the price frosted is 27 cents in standard package quantities of 175. Broken-package quantities are listed net. The reduction is approximately 4 cents per lamp on the previous list price.

Present Sales of Gasoline Engines Large.—The Fairbanks-Morse Company states that the demand for gasoline engines in sizes ranging from 1 hp to 50 hp is very large and that it is selling on an average 150 engines, aggregating 3000 hp, per week. Sales of type "B" induction motor with the squirrel-cage type of rotor and cast end-rings are very satisfactory.

Transmission-Line Equipment for Panama Canal.—Awards have been made for the greater part of the material required in the construction of the Cristobal-Balboa electric transmission line, 48 miles long, which will be the principal feeder of the proposed Isthmian transmission system, connecting a terminal substation at Cristobal with a similar one at Balboa. The contract for the fabrication and assembly of 627 steel track-span bridges for single track, and for 150 track-span bridges for double track, together with 3108 anchors, 7 ft. long, has been made to the United States Steel Products Company, which agrees to begin delivery in 150 days and complete it in 305 days. The only other bidder on the above material was the Riter-Conley Company of Pittsburgh. The plan of manufacturing this material at the company's shops and then assembling it on the Isthmus, the Canal Commission furnishing the erecting shed, necessary trackage and transportation facilities, quarters for the company's employees, etc., has been adopted. The successful bidder already has a force on the Isthmus working on other contracts. Award was also made to the United States Steel Products Company for supplying 1,500,000 ft. of No. 00 copper wire, and 500,000 ft. of 5/16-inch copper-clad wire, in competition with the National Brass & Copper Tube Company, the only other bidder. The contract for furnishing 4000 insulators, three-unit, suspension type, with monel-metal fittings, and 2500 insulators, three-unit, strain type, with monel-metal fittings, was awarded to the Locke Insulator Manufacturing Company of Victor, N. Y., in competition with the General Electric Company and the National Electric Supply Company. No award has yet been made for the substation equipment. The ground plates required for the work will be manufactured from old copper and cable now on the Isthmus.

Emerson Electric Manufacturing Company's Plans for Fan Season.—With few exceptions, the Emerson Electric Manufacturing Company has made no radical changes in its fan-motor product for the 1913 season. The line of alternating-current fans formerly known as the Trojan has been eliminated, however, the company feeling that by concentrating upon the manufacture of the higher grades of Emerson fan, the trade will receive better service from the larger stocks than when two lines were carried. The company's prices have been reduced noticeably since last season on both desk and ceiling fans of the induction type. No changes have been made in the quality of the product, and the company is offering its fans to the dealers this year with a five-year factory guarantee which the dealer can give to the purchaser with every Emerson desk, oscillating, ceiling or column fan. The improvements in induction desk and oscillating fans which the company made last year, such as the elimination of all moving contacts and the securing of improved speed regulation, have been tested by a year's service, and these, combined with the various standard features of the induction type, make a product which, the company feels, has demanded no radical changes in design. The Emerson oscillating fans are mechanical types, equipped with a worm and gear device which is now in its fourth season. The ceiling fans are unchanged from last year, except that the Trojan ceiling fan has been replaced with a new, plain-type Emerson model corresponding in design to the plain-type fan of the former Trojan line. A line of 12-in. and 16-in. three-speed, alternating-current and direct-current ventilating fan motors has been added to the list of the company's products.

A New Non-Continuous Filament Lamp Promised.—As a result of recent experiments by a leading German firm of lamp makers there is to be placed on the market shortly a new form of drawn-filament tungsten lamp with a non-continuous filament. The difference between this and the usual lamp lies in the fact that the filament is doubled at the upper supports, which construction it is claimed will add materially to the length of life when burned in a vertical position. The American sales are to be handled through the Union Light & Supply Company, New York City. The company states that the new lamps will be sold under a guarantee against breakage in transit and blackening in service and will have a specific consumption of 1.2 watts per candle for the smaller sizes and 1 watt per candle for the larger lamps.

Western Electric's Retail Store at Seattle.—In order to take care of the needs of individual customers, the Western Electric Company has opened a retail store in the retail district of Seattle, Wash. This store is at 907 First Avenue and handles all electrical appliances and supplies required by householders and business concerns. The line includes batteries, interphones, vacuum cleaners, lamps, motors, generators, wire and conduit. W. O. Preston, who was formerly associated with the Western Electric's distributing house in Seattle as house salesman, is manager of the retail store. The retail store organization is under the direct supervision of H. D. Brainard, who is sales manager of the Seattle branch and was until recently assistant sales manager at Dallas.

New Haven Electrification Nearing Completion.—According to advices from New Haven, Conn., the work of electrifying the line of the New York, New Haven & Hartford Railroad between Stamford, Conn., and New Haven is going forward rapidly and testing trains will be operated over portions of the line within the next two or three weeks. The structural work for carrying the overhead wiring is nearly completed, while the wiring is practically completed as far east as South Norwalk and will soon be finished as far as Bridgeport. Some delay has been caused by a strike of the electrical workers, but it is probable that everything will be in readiness for electrical operation by Aug. 1 at the latest.

Bell Electric Motor Company Enlarging Its Plant.—The Bell Electric Motor Company is adding two modern fireproof factory buildings to its present manufacturing plant at Garwood, N. J. These new buildings will be about 200 ft. long, will be of steel and concrete construction, and will be completed in about three months. In addition to the thoroughly modern design of the buildings, provision will be made for the installation of up-to-date testing apparatus by means of which single-phase, two-phase and three-phase current at all commercial voltages will be made available. The company states that its sales of single-phase motors have doubled during the past year.

Orders for Transmission Towers.—The Riter-Conley Company, Pittsburgh, has shipped 200 galvanized transmission towers on a rush order from the Pearson Engineering Corporation and 100 towers for the Ebro Irrigation & Power Company, which is the name of the electric-service company for which the Pearson syndicate is building a large hydroelectric development near Barcelona, Spain, as was described in these columns Jan. 25, 1913. A shipment of 100 galvanized towers will be begun shortly to the United Gas & Electric Company, Lancaster, Pa., and 445 towers are under order from the Salmon River Power Company.

Electric Railway Supplies in Demand.—The Ackley Brake & Supply Company, New York City, states that recent sales have been satisfactory. It has disposed of about 1500 ft. of automatic trolley guard, the largest purchasers being the Selma Street Railway Company, Selma, Ala.; Tri-City Railway Company, Davenport, Ia.; Saginaw & Bay City Street Railway Company, Saginaw, Mich., and Scranton Railway Company, Scranton, Pa. Large sales of "Monarch" refillable fuses are also reported to the United States, Carnegie and Lackawanna Steel companies, Standard Oil Company, New York Central Railroad, Lehigh Valley Collieries and Diamond Match Company.

New Pacific Coast Facilities for Paragon Sellers Company.—The Paragon Sellers Company, Chicago, has announced the transfer of its San Francisco stock to 440 Market Street, in charge of Paine, Bailey & Company, and of its Los Angeles stock to 443 East Third Street, in care of F. F. Foster & Company. Full stocks of Paragon ground cones, ironite wire, self-tying knobs, handy lamp brackets, battery boxes, etc., will be maintained at the above locations, where the company's facilities for the rapid handling of orders have been greatly improved.

Argo Electric Vehicle Company Increases Capital Stock.—The Argo Electric Vehicle Company, Saginaw, Mich., has increased its capital stock from $400,000 to $500,000.

Electrical Energy for Coal Mines.—The mines of the Providence Coal Company, near Punxsutawney, Pa., are to be equipped for electrical operation.

Reorganized Corporations Liable for Debts of Predecessors.—The practice of reorganizing corporations in order to escape burdensome contracts or payments to unsecured creditors received a severe setback this week through a decision handed down April 28 by the United States Supreme Court. According to this decision, a creditor of a corporation not a party to its reorganization can hold its successor for his debt. The principle in the matter, as laid down by Justice Lamar, was stated as follows: "Corporations insolvent or financially embarrassed often find it necessary to scale their debts and readjust stock issues with an agreement to conduct the same business with the same property under a reorganization. This may be done in pursuance of a private contract between bondholders and stockholders, and though the corporation property is thereby transferred to a new company having the same shareholders, the transaction would be binding between the parties. But, of course, such a transfer by stockholders from themselves to themselves cannot defeat the claim of a non-assenting creditor. As against him, the sale is void in equity, regardless of the motive with which it was made. For, if such contract reorganization was consummated in good faith and ignorance of the existence of the creditor, yet when he appeared and established his debt the subordinate interest of the old stockholders would still be subject to his claim in the hands of the reorganized company. There is no difference in principle if the reorganization instead of being effectuated by private sale is consummated by a master's deed under a consent decree."

Commonwealth Power, Railway & Light Company to Expand.—Plans have been formulated for the acquisition by the Commonwealth Power, Railway & Light Company, Jackson, Mich., of the Union Railway, Gas & Electric Company, which controls and operates a number of public-utility properties in Indiana, Illinois and Wisconsin, the Michigan United Railways Company, of Jackson, Mich., and the Springfield (Ill.) Light, Heat & Power Company. If the plan for taking over these properties is ratified by the stockholders of the various companies, the Commonwealth company will exchange its stock for stock of the other companies, increase its capital stock to $31,500,000 and issue $7,500,000 in bonds to provide the funds needed for extensive improvements and for construction work already completed and under way. Representatives of Hodenpyl, Hardy & Company, New York, and of E. W. Clark & Company, Philadelphia, the concerns interested in the merger, met on April 29 and arranged the details of the plan. A majority of the stockholders of the Commonwealth company have large holdings in the three other companies, according to interests affiliated with the first-named company, who stated also that the proposed merging of interests is merely a reorganization to centralize control, reduce expenditures and provide funds for the extension of interurban lines owned by the various companies. Commonwealth stockholders will meet May 15 to ratify the plan.

New Company Takes Over Chicago Electrical Supply Dealers.—A new Chicago mail-order house was incorporated on April 21. It is known as Harris Brothers Company and will issue $2,000,000 in preferred stock and $8,000,000 in common stock. The new company has absorbed the Chicago House Wrecking Company and the Harris Steel & Wire Company. These companies have been dealers in electrical materials among other things. The former has an extensive establishment at Thirty-fifth and Iron Streets and owns real estate which it values at $2,500,000. The officers of the new company are: President, A. Harris; vice-president, D. C. Harris; treasurer, F. Harris; secretary, S. H. Harris. Maurice Rothschild, the general manager, says that the parcel post opens great possibilities in the mail-order business, and that the new organization plans to take advantage of this opportunity by establishing branches in various parts of the country.

Western Demand for Hydraulic Machinery and Pipe.—Orders aggregating about 200,000 hp in hydroelectric machinery are reported by the Pelton Water Wheel Company. Turbine installations of 1200 hp by the Ottertail Power Company, Fergus Falls, Minn.; 20,000 hp by the City Electric Company, San Francisco, Cal.; 45,000 hp (three units) for the Los Angeles Aqueduct, and 60,000 hp by the British Columbia Electric Railway Company, Vancouver, B. C., are in progress, and an order for 4000 hp has been received from a Costa Rican project. The orders for welded pipe have also been large, including 1700 tons for the Vancouver Island Power Company, 350 tons for the San Joaquin Light & Power Company and 2000 tons for the Los Angeles Aqueduct.

Consolidated Gas, Electric Light & Power Financing.—At a special meeting on April 25 the stockholders of the Consolidated Gas, Electric Light & Power Company, of Baltimore, authorized an issue of $3,500,000 5 per cent debenture stock and an increase in the capital stock from $14,860,054 to $20,000,000. Of the new debenture stock, $2,500,000 has been disposed of through President Aldred to Kitcatt & Aitken, bankers, of London. The remaining $1,000,000 was offered and subscribed for in Baltimore.

Postpone Adoption of Northern Colorado Power Refinancing Plan.—Directors and stockholders of the Northern Colorado Power Company, Denver, Col., met on April 24 and decided to postpone the settlement of terms between stockholders and bondholders for refinancing the company until May 15. As was stated in these columns April 19, it has been necessary to prepare plans for refinancing the company in order to meet an issue of $853,000 in notes maturing this month.

New Combination Shade and Lamp Lock to Appear Soon.—Frederick Rall, New York City, announces that he will put out shortly a combination shade and lamp lock which will meet the demand for a suitable protective device for use on ornamental fixtures. The seal is both applied and removed by means of a small tool, resembling a paper punch, and the entire operation consumes not more than a minute.

Canadian Allis-Chalmers Company Chartered.—The Canadian Allis-Chalmers' Company, Limited, was incorporated at Ottawa, Can., on April 25, with a capital of $500,000. It will take over the Allis-Chalmers-Bullock Company, of Montreal, and will have head offices at Toronto.

Industrial Securities

Security	Capital Stock Listed	DIVIDEND		QUOTATION	
		Per Cent	Period	April 23	April 30
Allis-Chalmers, t.r., 4th pd..	$17,196,600	.....	.....	3	4½
Allis-Chal., pf., t.r., 4th pd..	14,168,000	.....	.....	7¼	11
Amalgamated Copper.....	153,887,900	1½	Q	77	71⅛
American Tel. & Tel.....	344,471,400	2	Q	129¾	128¼
Electric Storage Battery, c.	16,074,425	1	Q	49½	47½
General Electric.....	101,307,200	2	Q	140½	137½
Mackay Cos., c.....	41,380,400	1½	Q	83*	83*
Mackay Cos., pf.....	50,000,000	1	Q	67½	67½*
Western Union Tel.....	99,747,200	¾	Q	66⅛*	64½
Westinghouse, E. & M., c...	34,166,300	1	Q	64¼	61
Westinghouse, E. & M., pf..	3,998,700	1¼	Q	118½*	117½

*Last price quoted.

NEW YORK METAL MARKET PRICES

	April 22 Bid.	April 22 Asked.	April 29 Bid.	April 29 Asked.
Copper:				
Standard, spot.....	....	15.50	14.75	to 15.25
	£ s d		£ s d	
London, standard, spot.....	67 18 9		67 2 6	
Prime Lake 15.65	to 15.70		15.60	to 15.70
Electrolytic 15.55	to 15.65		15.45	to 15.55
Casting 15.40	to 15.50		15.30	to 15.40
Copper wire, base	16.75		16.75	to 17.00
Lead	4.50		4.50	
Nickel 40.00	to 45.00		40.00	to 45.00
Sheet zinc, f.o.b. smelter	7.75		7.75	
Spelter, spot	5.60		5.60	to 5.70
Tin, spot	49.40		49.50	
Aluminum:				
Prompt delivery 26.50	to 27.00		26.25	to 26.75
Future 26.50	to 27.00		26.25	to 26.75

OLD METALS

Heavy copper and wire	14.50	14.50
Brass, heavy	9.37½	9.37½
Brass, light	8.25	8.25
Lead, heavy	4.25	4.25
Zinc, scrap	4.87½	4.87½

COPPER EXPORTS IN APRIL

Total tons to April 30.....	32,043

Electric Securities

Q—Quarterly. M—Monthly. S—Semi-annually. A—Annually.

Security	Outstanding	Dividend		Last Quotation	
		Per Cent	Period	Bid	Asked
Adirondack Electric Power, c.	$9,500,000	.....	.....	15	18
Adirondack Elec. Power, pf.	2,500,000	.....	.....	55	60
Amer. Gas & Electric ($50), c.	2,500,000	2	Q	78	81
Amer. Gas & Electric ($50), pf	1,537,500	1½	Q	44	46
Amer. Light & Traction, c.	10,395,400	2½	Q	370	375
Amer. Light & Traction, pf.	14,236,200	1½	Q	105	107
Amer. Power & Light, c.	5,631,400	1	Q	73	74
Amer. Pwr. & Lt., 6% cum.pf.	5,631,400	1½	Q	79½	81
Amer. Pwr. & Lt., opt.warr.	1,604,000	.....	.....	12	14
Am. Pwr. & Lt., 6% notes,'21	2,199,100	3	S	99	100
Appalachian Power, c.	6,000,000	.....	.....	17	18
Appalachian Power, pf.	2,180,000	.....	.....	60	63
Arizona Power, c.	3,000,000	.....	.....	10	14
Arizona Power, pf.	850,000	.....	.....	45	50
Asheville L. & P., 1st s.f.5s,'42	1,100,000	2½	S	91	96
Aug'ta-Aiken R.&E.,s.f.5s,'35	2,588,000	2½	S	89	92
Augusta-Aiken Ry. & Elec.,c.	2,250,000	.....	.....	....	....
Augusta-Aiken Ry. & Elec.,pf	1,500,000	1½	Q	....	....
Augusta Ry. & El., 1st 5s, '40.	967,000	2½	S	100	....
Central Maine Power, 1st, 5s.	2,502,000	2½	S	94½	97½
Cities Service, c.	5,499,430	5–12	M	115	116
Cities Service, pf.	10,195,360	½	M	85½	86½
Col'bus R.Gas&El.,1st5s,'36.	2,454,000	2½	S	93	95
Columbus Ry., G. & Elec.,c.	2,000,000	.....	.....	....	....
Columbus Ry., G. & Elec.,pf.	840,000	1½	Q	50	....
Commonw.Edison, cap.stock.	37,764,140	7	A	131	....
Con. Gas, El. & Pr. (Balt.),4½s	11,564,000	2¼	S	87¼	88
Consum. Pwr. (Mich.),5s,'36.	10,088,000	2½	S	94½	97½
Consum. Pr. (Minn.),1st 5s,'29	9,528,000	2½	S	87	88½
Dallas Elec. Corp., 5s, '22.	3,659,000	2½	S	95	97½
Denver Gas & El. Lt.,c.	7,001,300	¼	M	220	....
Denver Gas & El. Lt., gen. 5s.	6,000,300	2½	S	95	95½
Edi. El. Ill., Boston,cap.stock	15,603,700	3	Q	275	....
Federal Light & Traction, c.	4,750,000	.....	.....	29	32
Federal Light & Traction,p f.	2,500,000	1½	Q	79	81
Fort Worth Pwr. & Lt., 1st 5s	1,500,000	2½	S	94	96
Harwood Electric, 5s, '39.	1,000,000	2½	S	100	103
Kansas City Rwy. & Lt., c.	9,543,080	.....	.....	14	17
Kansas City Rwy. & Lt., pf.	9,407,500	1½	Q	34	37
Kan. City R.&Lt., 1st ref.5s.	10,200,000	2½	S	86	89
Kan. City R. & Lt.,con.6s,'12	5,478,000	3	S	88	90
Lincoln Gas & Electric, c.	2,250,000	.....	.....	30	32
Lincoln Gas & Electric, 5s, '41	796,000	2½	S	78	80
Mobile Elect. Co., pf.	852,000	1¾	Q	92½	95
Mobile Elect. Co., 1st 5s, '46.	1,696,000	2½	S	86½	88
Northern States Power, c.	5,975,000	.....	.....	20½	21½
Northern States Power, pf.	8,386,700	1¾	Q	81½	83
Pacific Gas & Electric, c.	31,908,750	1½	Q	56	57
Pacific Gas & Electric, pf.	10,000,000	1½	Q	91½	92
Philadelphia Electric ($25).	24,987,750	1½	Q	22⅜	....
Portland General Electric, 5s.	8,000,000	2½	S	99	101½
Republic Railway & Light, c.	5,200,000	.....	.....	24	25½
Republic Railway & Light,pf.	6,360,000	1½	Q	74½	76½
Sierra & San Francisco Pwr., 1st 5s.	6,500,000	2½	S	92½	94½
St. Joseph's R., L., H. & P.,5s	4,637,000	2½	S	98	99½
Seattle Electric Co.,con.5s,'29	7,417,000	2½	S	96½	99
Southern Calif. Edison, 5s, '39	10,043,000	2½	S	93	96
Southern Power, 5s.	5,000,000	2½	S	98	100
Standard Gas & Elec. ($50),c.	9,343,150	.....	.....	14	15
Standard G. & Elec. ($50), pf.	10,977,950	2	Q	43½	45
Tennessee R., L. & Powr., c.	20,000,000	.....	.....	19¾	20¾
Tennessee R., L. & Pwr., pf.	10,250,000	1½	Q	74	75
Western Power.	14,670,000	.....	.....	16	17½
Western Power, 6% cum. pf.	6,000,000	.....	.....	47	49
Western States Gas & El., c.	3,503,000	.....	.....	43	48
Western States Gas & El., pf.	1,800,000	1¾	Q	80	86
W. Sta's G. & E.,1st&r.5s,'41.	3,400,000	2½	S	90	95

Personal

Mr. R. J. Lee has been appointed contract agent of the Toronto (Ont.) Hydro-Electric System, as successor to Mr. F. R. Ewart.

Mr. J. B. Kitchen has been appointed engineer of operation of the Toronto (Ont.) Hydro-Electric System, vice Mr. A. C. McCallum.

Mr. George Stevenson has been promoted to the position of general inspector with the Toronto (Ont.) Hydro-Electric System, replacing Mr. H. D. Ord, resigned.

Mr. Engene C. Bacot, recently connected with H. M. Byllesby & Company in the Chicago office, is now assistant engineer with McMeen & Miller, engineers, Chicago.

Mr. I. E. Moultrop, formerly mechanical engineer of the Edison Electric Illuminating Company of Boston, has been promoted to the position of assistant superintendent of construction.

Mr. W. R. Sweany, until very recently acting general manager of the Toronto Hydro-Electric System, was appointed sales manager of the Toronto Electric Light Company, Ltd., May 1.

Mr. D. W. Roper, assistant to the chief operating engineer of the Commonwealth Edison Company, has been elected chairman of the Chicago Section of the American Institute of Electrical Engineers.

Mr. J. Orr, formerly connected with the Toronto (Ont.) Electric Light Company, Ltd., has been appointed general superintendent of the Toronto (Ont.) Hydro-Electric System, to succeed Mr. H. C. Smith, resigned.

Mr. C. L. De Muralt, of the electrical engineering department of the University of Michigan, has received a month's leave of absence that he may go to Germany as a consulting engineer on some railway electrification work.

Mr. Thomas Duncan, of Princeton, Ind., has been appointed chairman of the Public Service Commission of Indiana by Governor Ralston. Mr. Duncan will begin his term of office on May 1, when the utility act takes effect.

Mr. C. H. Dudley, late of the Northern Electric & Manufacturing Company, Toronto, Ontario, has been appointed manager of the appliance department of the Toronto Hydro-Electric System, Toronto, Ont., succeeding Mr. Clark.

Mr. G. W. Thompson, superintendent of the Westmount (Ont.) municipal lighting plant, who has been appointed acting controller for the city, was formerly connected with the Lachine Rapids Company of Montreal and the Montreal Light, Heat & Power Company.

Mr. W. O. Vickery, who has been in the employ of the Trinidad (Col.) Electric Transmission, Railway & Gas Company, has been appointed superintendent of the southwest division of the Federal Light & Traction Company, which also controls the Trinidad property.

Mr. Mason D. Pratt has been appointed engineer of the United Railways & Electric Company, Baltimore, Md., under Mr. John M. Hood, Jr., consulting engineer of the company. Mr. Pratt is a graduate from Lehigh University and has been engaged in consulting engineering practice at Harrisburg, Pa., since 1904.

Mr. H. K. Smith, electrical superintendent of the Fifth Division of the Panama Canal Zone, has resigned, and the position has been abolished. Mr. C. W. Lawton, station engineer, has received charge of the Miraflores electric plant, and Mr. H. E. Wilkins is to have supervision of the outside electrical work of the Fifth Division.

Mr. E. F. Putnam has been appointed commercial manager of the United Electric Light & Water Company, of Greenwich, Conn. Mr. Putnam was at one time connected with the Public Service Electric Company at Camden and Newark, N. J., and at the time of his appointment he was sales engineer of the lamp works of the General Electric Company.

Mr. Arthur J. Sweet has tendered his resignation as commercial engineer of the Holophane Works of the General Electric Company, to become a member of the firm of Vaughn & Meyer, consulting engineers, of Milwaukee, Wis. Mr. Sweet has been identified with research and commercial

development work in the field of illuminating engineering for the past five years, during the last two of which he has given special attention to the subject of railway lighting.

Mr. H. Lester Hamilton has been appointed advertising manager of the Consolidated Gas, Electric Light & Power Company, of Baltimore. For the last three years Mr. Hamilton has been connected with N. W. Ayer & Son, of Philadelphia, and before that he was employed in the advertising department of the General Electric Company. He graduated in 1906 from the engineering department of the North Carolina College of Agriculture and Mechanic Arts.

Mr. William C. Andrews has joined the Edison Storage Battery Company's organization as sales engineer, with headquarters at Orange, N. J. Mr. Andrews was formerly sales engineer of the Stanley Instrument Company, Great Barrington, Mass., and later connected with the engineering and sales department of the General Electric Company in Schenectady, N. Y., and Harrison, N. J. For the past two years he has been secretary of the Rae Company, New York City.

Mr. Emerson McMillin, well known in public-utility circles and chairman of the board of managers of the American Light & Traction Company, New York, has made a personal gift of furniture to employees of the American Light & Traction Company who suffered loss in the recent floods of Ohio. Enough furniture to furnish 100 homes completely was ordered from Grand Rapids, Mich., seventy-five complete outfits being sent to Columbus families and the other twenty-five outfits to families in Ironton.

Mr. Conrad D. Trubenbach has associated himself with Mr. Daniel R. Bacon, consulting engineer, New York, and specialist in power plant and factory design. Mr. Trubenbach is a graduate of Columbia University and has been with the Pennsylvania Railroad Company on the East River Tunnel work and with the marine department of the New York Central Railroad Company. For four years he was connected with the Rapid Transit Commission and its successor, the Public Service Commission, on the New York subway construction.

Mr. G. W. Esslinger has been appointed chief engineer of the Lackawanna & Wyoming Valley Power Company, Scranton, Pa., which leases and operates the generating station of the Lackawanna & Wyoming Valley Railroad and supplies the latter with electrical energy. Mr. Esslinger was at one time superintendent of power and transmission for the Washtenaw Light & Power Company, Ypsilanti, Mich., and superintendent of electric railway lines operating between Detroit and Jackson, Mich., and previous to his present appointment was electric line foreman with the company of which he is now chief engineer.

Mr. Seymour W. Cheney has been appointed operating engineer of the La Crosse (Wis.) Gas & Electric Company. Mr. Cheney is a graduate of the University of Wisconsin. He entered the gas and electric business in 1905 as cadet engineer with the Denver (Col.) Gas & Electric Light Company, and the following year was appointed superintendent of distribution of the Lincoln (Neb.) Gas & Electric Company. Later he held a similar position with the Montgomery (Ala.) Light & Power Company. Since 1910 he has been on the engineering staff of the Railroad Commission of Wisconsin, with headquarters in Milwaukee.

Mr. William Spencer Murray, chief electrical engineer of the New York, New Haven & Hartford Railroad Company, retired from that position on May 1 and will engage with Mr. E. H. McHenry in consulting and constructing engineering work. He has opened an office in the Second National Bank Building, New Haven, Conn., whence he will direct all the new electrification work of the New York, New Haven & Hartford Railroad Company as its consulting engineer. Mr. Murray, who was born at Annapolis, Md., August 4, 1873, is a graduate of Lehigh University, and from the time of his graduation in 1895 up to 1901 was in the employ of the Westinghouse Electric & Manufacturing Company. He resigned from the latter company to engage in consulting engineering work in Boston, Mass., and when in 1905 the New York, New Haven & Hartford Railroad Company decided to electrify its New York division Mr. Murray was appointed electrical engineer of the company. An exhaustive analysis and comparison of electric railway systems led him finally to the conclusion that the single-phase system possessed the greatest merit for the proposed electrification, and his recommendation in its favor was adopted. He afterward made a most valuable contribution to the subject of the alternating-current single-phase railway in a paper before the American Institute of Electrical Engineers in December, 1908. Mr. Murray is a member of the Engineers' Club of New York and of the Graduate Club of New Haven. He is a Fellow of the A. I. E. E.

Obituary

Horatio A. Foster, well known as the author of the "Electrical Engineer's Pocket-Book" bearing his name, who had charge of the appraisal work of J. G. White & Company, died of heart failure in the Grand Central subway station, New York City, on April 27. Mr. Foster was born at Bustleton, Pa., on Jan. 12, 1858. His electrical engineering training began in the fall of 1884, with the Daft Electrical Company. The following spring he was sent to Baltimore to electrify a short branch for the Baltimore Union Passenger Railway Company, which is said to have been the first commercial electric railway in the United States. Later he became connected with the Thomson-Houston Electric Company at Lynn, Mass., and in the fall of 1888 he was appointed superintendent of the East River Electric Light Company, New York City, remaining with that company and its successors until July, 1891. At that date he was appointed an expert for the United States Census Office, to compile data on the electrical industry of New York State, which was the only state in the Union taking an electrical census in 1890. In May, 1893, he accepted a position in the editorial department of *Electrical Industries*. Late in that year Mr. Foster became associated with Prof. George Forbes, then the electrical engineer of the Niagara Falls Power Company, and he had charge of his New York office for about a year and a half. Early in 1895 Mr. Foster joined the staff of the Cataract Construction Company, of Niagara Falls, as testing engineer for determining the cost of steam power, which work occupied about a year and a half. After some years of general practice as consulting engineer, Mr. Foster was in 1901 appointed receiver of a brewery trust in Philadelphia which had failed. During this period he had also several important engineering undertakings, one of which was the valuation of land for 10 miles along both sides of the Susquehanna River. In 1906 he was engaged by Mr. L. B. Stillwell and placed in charge of his work for the United Railways & Electric Company of Baltimore, in rehabilitating its generating and distribution system. In 1898 he was retained by Mr. Bion J. Arnold, Chicago, and assisted in the appraisals of the property of the Metropolitan Traction Company in New York City, the Detroit United Railway Company and the Southern California Edison Company at Los Angeles. Since that time Mr. Foster had been working on valuation of public utilities and studying traffic conditions and other matters pertaining to public service, being engaged in this work with J. G. White & Company at the time of his death. Besides the "Electrical Engineer's Pocket-Book" Mr. Foster was the author of "Valuation of Public Utilities," and he had frequently contributed to the technical press. Mr. Foster was fifty-five years old at the time of his death and was a member of the American Institute of Electrical Engineers, the American Society of Mechanical Engineers, the Engineers' Club of New York and the Philadelphia Arts Club. He is survived by a widow, son, mother and two sisters.

HORATIO A. FOSTER

Construction

New England

MANCHESTER, N. H.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 26 for alterations in the heating apparatus, alterations in lighting fixtures and construction changes in the United States post office and court house at Manchester, N. H., in accordance with drawings and specifications, copies of which may be obtained at the above office or at the office of the custodian. O. Wenderoth is supervising architect.

CHATHAM, MASS.—At a town meeting held recently the Selectmen were instructed to grant the Buzzards Bay El. Co., of Falmouth, a franchise to construct and operate an electric-light plant here.

SOUTHBRIDGE, MASS.—Plans and specifications for improvements to the lighting system in Southbridge, involving an expenditure of about $15,550, have been submitted to the Selectmen by the Webster & Southbridge Gas & El. Co. It is proposed to replace the arc lamps now in use with tungsten lamps. On Main Street ornamental standards carrying five-lamp clusters will be erected.

SUTTON, MASS.—The Worcester Consol. St. Ry. Co., of Worcester, has been granted permission by the Selectmen to erect feed wires over the highway between West Millbury and West Sutton and from the West Sutton road to North Oxford.

PROVIDENCE, R. I.—Bids will be received at the office of the Board of Contract and Supply, City Hall, Providence, until May 21 for furnishing a 30,000,000-gal. pumping plant at Pettaconset pumping station, Cranston, as follows: (a) For a high-duty steam engine and plunger pumps, with boilers; (b) electric motor-driven centrifugal pumps; (c) steam-turbine-driven centrifugal pumps with boilers. Plans and specifications may be procured at the office of the city engineer, city hall. Joseph H. Gainer is Mayor and chairman of Board of Contract and Supply.

BRISTOL, CONN.—The Bristol & Plainville Tramway Co. has entered into a contract with the Connecticut Co., of New Haven, whereby the latter will furnish electricity to operate the railway system of the former from the power plant at Falls Village when completed.

NEW BRITAIN, CONN.—The city of New Britain has applied to the State Legislature for amendments to its charter allowing it to take over the electric-light and power plant, to be owned and operated by the municipality.

Middle Atlantic

BINGHAMTON, N. Y.—The city has purchased a site on Noyes Island for the municipal electric-light plant. Douglas Sprague, 39 Cortland Street, New York, is consulting engineer.

BUFFALO, N. Y.—Bids will be received by the commissioner of public works, Room 5, Municipal Building, Buffalo, N. Y., until May 9 for furnishing material and construction of a two-story bathhouse, to be known as Public Bathhouse No. 2, including electric wiring, lighting fixtures, plumbing, gas-fitting, heating, ventilating, radiation, etc., to be located on Penn Street. Francis G. Ward is commissioner of public works.

FORT H. G. WRIGHT, N. Y.—Bids will be received until May 19 for construction, including plumbing, heating, electric wiring and fixtures, of addition to and alterations of hospital at Fort H. G. Wright. For further information address Captain G. Robinson, constructing quartermaster.

MARCELLUS, N. Y.—The Marcellus Ltg. Co. has applied to the Public Service Commission for permission to acquire the plant and franchises owned by Frank W. Knapp in Marcellus and to exercise franchise for distributing electricity here.

NEW YORK, N. Y.—Bids will be received by the commissioner of water supply, gas and electricity, Department of Water Supply, Gas and Electricity, Room 1903, 13 to 21 Park Row, New York, until May 9 for furnishing and installing the electric-lighting system and gas fitting in the Ninety-eighth Street pumping station. Blank proposal forms, specifications, etc., can be obtained upon application to the above office. Henry S. Thompson is commissioner.

NYACK, N. Y.—The Rockland Lt. & Pwr. Co., of Nyack, has petitioned the Public Service Commission for approval of the exercise of franchises for the distribution of electricity in the villages of Hillburn and Suffern.

OSWEGO, N. Y.—The People's Gas & El. Co. will soon begin work on the extension of its transmission line from Fruit Valley to Southwest Oswego, a distance of 3 miles. The company also contemplates extending its lines to other towns. R. F. Whitney is manager.

PLEASANT VALLEY, N. Y.—The Poughkeepsie Lt., Ht. & Pwr. Co. has been granted a franchise to furnish electricity in Pleasant Valley and also a contract for lighting the streets of the village. H. J. Halstead is village clerk.

CHAMBERSBURG, PA.—The City Council has adopted a resolution providing for improvements and installation of new machinery in the municipal electric-light plant, the cost not to exceed $30,000.

EASTON, PA.—The Borough Council of Glendon has granted the Eastern Pennsylvania Pwr. Co., of Easton, a franchise to erect transmission lines in the borough to furnish electricity for lamps and motors.

LEBANON, PA.—The Lebanon Valley El. Lt. & Pwr. Co. is building foundations for a pair of Babcock & Wilcox boilers, with a rating of 250 hp each, at its plant at First and Lehman Streets. The company will soon begin the erection of a new brick power station to take the place of the present power house. The new equipment will also include two electric generators having a rating of 250 kw each.

PHILADELPHIA, PA.—Application will be made on May 5 to the Governor of the State of Pennsylvania by John Barbey, Frank Battles and Walter T. Bilyeau for charters for 20 electric-light corporations to operate in Bucks County as follows: The Borough of Bristol Lt. Co., South Langhorne Lt. Co., Langhorne Manor Lt. Co., Langhorne Lt. Co., Yardley Lt. Co., Bristol Township Lt. Co., Borough of Doylestown Lt. Co., Hulmeville Lt. Co., Lower Makefield Lt. Co., Morrisville Lt. Co., Falls Lt. Co., Upper Makefield Lt. Co., Middletown Lt. Co., Solebury Lt. Co., New Hope Lt. Co., Taylorsville Lt. Co., Wrightsville Lt. Co., Buckingham Lt. Co., Newton Lt. Co. and Doyleston Lt. Co. The companies will operate in the townships from which they take their name.

SOMERSET, PA.—The Penn El. Ser. Co., a subsidiary of the Citizens' Lt., Ht. & Pwr. Co., of Johnstown, has taken an option on the property of the Somerset El. Lt., Ht. & Pwr. Co. The Citizens' company proposes to erect a high-tension transmission line from Johnstown to Somerset and to secure contracts for the lighting of Hollsopple, Hooversville, Stoyestown and other places. The Somerset plant will be operated until the new system is completed.

YORK, PA.—The Secretary of State has approved the application of the Edison El. Lt. Co., of York, to increase its capital stock from $250,000 to $1,100,000.

CHATHAM, N. J.—Bids will be received by the Board of Commissioners of the borough of Chatham until May 12 for extensions and additions to the municipal water and light system as follows: (1) For alterations and additions to power house; (2) one 100-kw turbo-generator unit; (3) one 100-hp condenser; (4) two 150-hp water-tube boilers and breeching; (5) one 75-kw, three-phase, 2300-volt generator and exciter; (6) one switchboard complete; (7) one 500,000-gal. motor-driven pump; (8) radial brick chimney; (9) industrial railway complete with charging car and scales. Specifications and blank proposals may be obtained from C. E. Hewett, of Durham, N. H., engineer, or from W. S. Angel, borough clerk, Chatham. Plans may be seen at the office of the borough clerk.

NEWARK, N. J.—Plans are being considered for making improvements to the electric-lighting plant in the city hall to provide for emergencies. The installation of a 50-kw generator and engine is under consideration.

EASTON, MD.—The property of the Easton Lt. & Fuel Co. has been sold to Samuel R. Kirkpatrick & Co., of Philadelphia, Pa. Improvements will be made to the plants by the new owners. The officers of the new company are: Frederick H. Treat, president, and Samuel Kirkpatrick, secretary and treasurer, both of Philadelphia, Pa.

GRAHAM, W. VA.—Preparations are being made by the Appalachian Pwr. Co. for remodeling the entire electric-light system in Graham, involving an expenditure of from $7,000 to $10,000. The distributing system will be rebuilt and new street lamps installed. The contract for poles has been awarded to McMullin & Hart.

WHEELING, W. VA.—A permit has been granted to the West Penn Trac. Co. for the erection of a large addition to the Water Street power house of the Wheeling Trac. Co. The cost of the improvements is estimated at about $25,000.

EAGLE ROCK, VA.—The installation of an electric-light plant in Eagle Rock is under consideration. J. E. McInnis is interested in the project.

WASHINGTON, D. C.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until May 20, at the various navy yards and naval stations, for the following supplies: Washington, D. C., Schedule 5395—one automobile ambulance. Brooklyn, N. Y., Schedule 5401—5000 ft. ¾-in. galvanized-steel conduit. Newport, R. I., Schedule 5384—one motor-driven punch press. Applications for proposals should designate the schedule desired by number. T. J. Cowie is paymaster-general, U. S. N.

North Central

CHEBOYGAN, MICH.—The Cheboygan El. Lt. & Pwr. Co. will begin work at once on the construction of the Pellston line. The company will connect the circuit at Black River dam with that on the Maple River dam near Pellston, which it purchased last fall.

MARQUETTE, MICH.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 13 for a conduit and wiring system, gas piping, lighting fixtures, etc., in the United States post office, Marquette, Mich., in accordance with plans and specifications copies of which may be obtained at the above office or at the office of the custodian, Marquette. O. Wenderoth is supervising architect.

MUSKEGON, MICH.—An agreement has been reached between the City Council and the Chamber of Commerce whereby the arc-lamp light

ing system on Western Avenue will be replaced by ornamental cluster lamps.

PONTIAC, MICH.—Bids will be received by the Board of Education, Pontiac, Mich., until May 15 for electric wiring in connection with the high-school building now being erected on Huron Street. Plans and specifications may be obtained at the offices of G. L. Jenner, superintendent of schools, Pontiac; Perkins, Fellows & Hamilton, 6 North Clark Street, Chicago, Ill., architects, and John W. Case, 37 Saginaw Street, Pontiac, associate architect.

QUINNESEC, MICH.—The Oliver Iron Mining Co. has decided to install a hydroelectric power plant to furnish electricity for operating the machinery at the Chapin Mine. A steel and concrete power house will be built and equipped with two 2800-hp turbines, each to be directly connected to a 1875-kw, three-phase, 60-cycle, 2300-volt generator. Electricity will be transmitted at 13,200 volts. The transmission line will be erected on steel towers to the No. 2 shaft at the Chapin Mine.

AKRON, OHIO.—The Northern Ohio Trac. & Lt. Co., of Akron, has closed a contract with the B. F. Goodrich Co., manufacturers of automobile tires and other rubber goods, to furnish energy to the amount of 4500 hp to be used in connection with its present power plant. The company guarantees a continuous service and to insure this will erect duplicate feed wires between its power station and the Goodrich plant.

CINCINNATI, OHIO.—Plans are being considered by the Union Gas & El. Co. for the construction of a new plant to cost between $3,000,000 and $4,000,000. The acquiring of the canal by the city for the purpose of transforming it into a subway and boulevard necessitates the abandonment of the electric plant at Plum Street and the canal. The new plant will probably be located on the site of the old West End station. A. B. Leach is president of the company.

FINDLAY, OHIO.—Plans have been submitted to the City Council by John S. Riegle, electrical engineer, for the erection of an electrical distributing system. The estimates submitted provide only for the distribution of street lighting and do not include the distribution of electricity for commercial lighting or for generating machinery. It is proposed to purchase energy to operate the system. The cost of the distributing system is estimated at $42,000.

GALION, OHIO.—The city of Galion is contemplating the installation of cluster lamps on 12 blocks. F. B. Ray, of Cleveland, is engineer. Henry Hocker is director of public service.

MARIETTA, OHIO.—The City Council has passed an ordinance authorizing the director of public service to enter into a contract with the Parkersburgh, Marietta & Interurban Ry. Co. for lighting the streets of the city for a period of ten years. The company will begin at once on the installation of a new lighting system, involving an expenditure of from $10,000 to $20,000. The municipal electric-light plant was destroyed by the flood.

TOLEDO, OHIO.—Bids will be received by the Board of County Commissioners of Lucas County at the office of the county auditor, Court House, Toledo, Ohio, until May 19 for furnishing material and construction of power house for the Lucas County Infirmary and Hospital for Tuberculosis. Bids will be received at the same time and place for furnishing and installing the mechanical power-plant equipment for said power house. Plans and specifications for power house and equipment are on file at the office of the county auditor and of David L. Stine, architect, Valentine Building, Toledo. Charles J. Sanzenbacher is county auditor.

LOUISVILLE, KY.—The Seelbach Hotel Co., of Louisville, has secured a permit for the erection of a six-story annex in the rear of its hotel at Fourth Avenue and Walnut Street, to cost approximately $75,000. A large electric light and power plant will be installed in the new building.

GOSHEN, IND.—Bids will be received at the office of William A. Books, city clerk, until May 19 for furnishing material and labor and constructing an electric-light plant as follows: (1) For furnishing and installing a 250-kva generator, switchboard, arc regulators, lamps and all electrical equipment; (2) furnishing and installing engine, condenser and piping; (3) furnishing and installing all material and equipment for ornamental street-lighting system; (4) furnishing and installing concrete work and the dismantling and removal of old machinery. Plans and specifications are on file at the office of the city clerk, Goshen, and at the office of Burns & McDonnell, Scarritt Building, Kansas City, Mo., consulting engineers.

INDIANAPOLIS, IND.—Improvements to the power plant of the Merchants' Ht. & Lt. Co., located on West Washington Street, to cost approximately $100,000, will begin within the next 30 days. The plans provide for the erection of an addition, 84 ft. by 65 ft., to the present power station in which a battery of eight boilers of 500 hp each will be installed. Provision will be made to double the boiler capacity when necessary. E. Darrow is general manager.

LAFAYETTE, IND.—Notice has been filed of the consolidation of the Merchants' Ltg. Association, of Lafayette, and the Crawfordsville Lt. & Wtr. Co. and some smaller properties of the same kind under the name of the General Service Co. The new company is capitalized at $900,000. The incorporators are: William H. Griest, Thomas B. Frazee and Henry H. Beach.

TERRE HAUTE, IND.—Steps have been taken by the civic organizations, the City Council and the Board of Public Works for the installation of an ornamental street-lighting system in the business district. Estimates have been asked for maintaining the lamps. It is proposed to erect ornamental standards carrying three-lamp clusters.

WABASH, IND.—The capital stock of the Wabash Wtr. & Lt. Co. has been increased from $160,000 to $500,000.

WAYNETOWN, IND.—Plans are being considered to install a municipal electric-light plant here. The contract for street-lighting with Thomas Llewellyn, owner of the local plant, has been revoked.

ATWOOD, ILL.—The Village Board has granted the Central Illinois Pub. Ser. Co., of Mattoon, a franchise to erect and operate an electrical distributing system in Atwood. The company has also been given a contract to light the streets of the village.

BISMARCK, ILL.—Residents of Bismarck are contemplating the installation of an electric-lighting system and have under consideration a plan to secure electricity from the Hoopeston Gas & El. Co., of Hoopeston.

CAIRO, ILL.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until May 29 for a conduit and wiring system in the United States Marine Hospital, Cairo, Ill., in accordance with plans and specifications copies of which may be had at the office of the custodian, Cairo, or the above office. O. Wenderoth is supervising architect.

CARLINVILLE, ILL.—The Carlinville Utilities Co. contemplates the installation of a new street-lighting system.

CHICAGO, ILL.—Bids will be received by the Board of Directors of the Municipal Tuberculosis Sanitarium of the City of Chicago, Room 1514, Fort Dearborn Building, 105 West Monroe Street, Chicago, until May 16, for construction complete of an infirmary group consisting of administration building and men's and women's infirmary, including electrical work, steam heating, plumbing, gas piping, elevators, etc., for the Municipal Tuberculosis Sanitarium of Chicago, at North Fortieth Street and Bryn Mawr Avenue. Plans and specifications are on file at the above office. Harlow N. Higinbotham, Theodore B. Sachs, M.D., and George B. Young, M.D., are members of the Board of Directors.

FARMINGTON, ILL.—The Farmington Lt. & Pwr. Co. will extend its transmission line to Fiatt to supply electrical service there. A 10-kw outdoor substation will be erected, equipped with 10-kw transformers; about 2 miles of overhead-line material will be used and 20 meters. Theodore Bass is owner and manager of the company.

PEORIA, ILL.—The capital stock of the Central Illinois Lt. Co. has been increased from $750,000 to $7,500,000. The company was recently incorporated to take over electric plants in Pekin, Washington, Eureka, Farmington, Elmwood, Princeville, Hanna City, Cuba, London Mills and Roanoke, which were purchased by the Peoria Gas & El. Co. during the past year. H. T. Willett is secretary and H. D. Furlong general manager. The headquarters of the company will be located in Peoria.

PRESTON, ILL.—The Barnes El. Lt. & Pwr. Co., of Maquoketa, has submitted a proposition to the city of Preston, offering to furnish electricity for lamps. The company agrees to erect the transmission line from Maquoketa to Preston. The city is to erect and maintain the distributing system.

SPRINGFIELD, ILL.—The Springfield Gas & El. Co., a consolidation of the Springfield Lt. & Pwr. Co. and the Springfield Gas Lt. Co., has filed a notice of increase in capital stock to $3,000,000.

SPRINGFIELD, ILL.—The Board of Local Improvements has adopted a resolution providing for installing three-lamp standards in the residence district and five-lamp standards in the business district of Fourth Street. Estimates have been submitted for a one-lamp system in the residence district, to cost $11,000.

WHITE HALL, ILL.—The Central Illinois Pub. Ser. Co., of Mattoon, is reported to have secured a contract to furnish electricity for the plants of the White Hall Sewer Pipe Co. and the Illinois Drain Tile Co., of White Hall, and the tramway system operated by the two companies. This will necessitate the erection of an additional transmission line, at a cost of about $52,000.

AMERY, WIS.—A deal has been closed whereby E. J. Schneider will furnish the Amery El. Co. with energy from his plant at Little Falls, on Apple River. Electricity will be transmitted to the city limits and distributed by the local company. The contract calls for a 24-hour service.

BUHL, MINN.—Bonds to the amount of $20,000 have been voted for improvements to the water, light and pumping station.

GRASSTON, MINN.—The Village Council has accepted the proposition of the Eastern Minnesota Pwr. Co., of Pine City, to furnish electricity for lighting the village.

MINNEAPOLIS, MINN.—The Great Northern R. R. Co. has taken out a building permit for the foundation and lower portion of the new power house it is to erect in the rear of the passenger station now being built, to cost about $60,000. The amount represents only a part of the total cost of the plant.

RENVILLE, MINN.—We are informed that the City Council has not granted the Lethert El. Co., of St. Paul, a franchise to install and operate an electric-light plant as reported in the issue of April 26. Harold Baker is city clerk.

ROCHESTER, MINN.—Bids will be received by W. F. Lenz, secretary of the Public Utilities Board, for furnishing one car-load of cedar poles, 35 ft. long (7-in. top), for the municipal electric-light system.

WINONA, MINN.—The installation of an ornamental street-lighting system in the business district is under consideration. The Commercial Club is interested in the project.

ADEL, IA.—The Adel Mill Co. has been granted franchises in De Sota and Van Meter to furnish electricity in both towns. The company will begin work at once on extensions of its transmission line. A new generator is being installed in the plant of the Adel Mill Co.

ANAMOSA, IA.—The Smith-Dows-Reed Lt. & Pwr. Co. is reported to have taken over the plants and holdings of the Anamosa-Oxford Junction Lt. & Pwr. Co., which operates in Anamosa, Wyoming, Olin and Oxford Junction.

CHARLOTTE, IA.—We are informed that it is not proposed to install an electric-light plant in Charlotte, as reported in the issue of April 19.

DAVENPORT, IA.—The Iowa & Illinois Ry. Co., of Davenport, has been granted franchises to furnish electricity for lamps and motors in the towns of Camanche, Princeton and Le Claire. The service will be furnished from the transmission lines of the company and no separate power plants will be erected. P. P. Crafts is vice-president and general manager.

DES MOINES, IA.—The Department of Streets is negotiating with the Des Moines El. Co. for a special rate for lighting the Seventh Street viaduct. There are 80 lamps to be maintained on the structure.

KEOKUK, IA.—The City Council has agreed to pay the cost of maintaining an ornamental street-lighting system on Main Street. The property owners will pay the cost of the installation of the system. The Keokuk El. Co. will erect the lamp standards.

MARCUS, IA.—Arrangements are being made by K. C. Gaynor, of Sioux City, for the installation of an electric-light plant in Marcus. Three-phase alternating current will be used. Most of the machinery for the plant has been purchased. The company will be known as the Marcus El. Co.

MARENGO, IA.—The Cedar Rapids & Iowa City El. Lt. & Pwr. Co., of Cedar Rapids, has purchased the property of the Marengo El. Lt. & Pwr. Co.

MOUNT AYR, IA.—The Mount Ayr Lt. & Pwr. Co. contemplates improvements to its plant during the summer and fall involving an expenditure of about $10,000. New equipment, including engines, boilers and generators will be installed.

TIPTON, IA.—The Tipton Lt. & Htg. Co. will soon begin work on the construction of a new substation.

MARSHFIELD, MO.—The Marshfield El. Co. is contemplating the installation of an upright (marine-type) direct-connected electric-generating unit and will soon ask for estimates on cost of same. The company will furnish electricity for lamps in Marshfield and later may furnish power for motors.

ROLLA, MO.—The City Council is contemplating the purchase of a new boiler for the municipal electric-light plant and water-works system.

WELLSTON, MO.—Steps have been taken by the Wellston Business Men's League to secure funds for the installation of an ornamental street-lighting system extending from the business center of Wellston to the grounds of the Universal Exposition Co.

ELGIN, N. D.—The installation of an electric-light plant in Elgin is under consideration.

ARMOUR, S. D.—We are informed that the city of Armour has not voted bonds for the installation of a municipal electric-light plant as reported in the issue of April 26. The local electric plant is owned by the Interstate Pwr. Co., of Wagner, which owns several plants in this locality. The Interstate Pwr. Co. is said to be contemplating building a central power plant to furnish electric service to all the neighboring towns, and discarding its small plants.

LENNOX, S. D.—The Lennox Milling Co. has been granted a 20-year franchise to install and operate an electric-light system here.

PIERRE, S. D.—The proposition to install an electric-light plant and water-works system in Pierre will soon be submitted to the voters.

WILMOT, S. D.—Bids, it is reported, will be received by R. H. Eastman, city auditor, for the following equipment for the municipal light and water plant: For one 56-in. by 16-ft. return tubular boiler, built for 100-lb. pressure; one 40-ft. stack, guy ropes, etc.; one automatic, high-speed steam engine, or one kerosene engine, complete, less air compressor and tank, and band wheel or pulley of proper size to operate generator with 18-in. pulley at speed of 900 r.p.m.

RULO, NEB.—Bonds to the amount of $10,000 have been voted for the installation of an electric-light plant.

SILVER CREEK, NEB.—At an election held April 15 the proposition to issue bonds for the installation of an electric-light plant and water-works system was carried.

AUGUSTA, KAN.—Worley & Black, of Kansas City, Mo., consulting engineers, are preparing plans for the proposed municipal electric-light system. The plant will be driven by two gas engines. Joseph R. Switzer is city engineer.

FORT LEAVENWORTH, KAN.—Bids will be received at the office of the constructing quartermaster, Fort Leavenworth, Kan., until May 8 for furnishing electrical supplies as follows: For 1420 outlet boxes, 310 electric-lamp brackets, 2730 bushings, 70 conduit clamps, 310 insulating joints, 21,810 ft. electric conduit, 25 electric condulets, 1860 outlet box covers, 3000 conduit lock nuts, 1325 receptacles, 500 bases, 1900 standard stools, 384 Holophane shades, 295 fixture studs, 40 lb. solder, 48 lb. tape, 22,100 ft. stranded conductor, 300 ft. lamp cord, 2000 ft. rubber-covered fixture wire, 6 panelboards, 6 panelboard cabinets, 2 switchboard panels, 12 units, 24 terminals, 1 slate, 1200 gross screw anchors, rubber matting, etc. For further information address Lieut. Col. Thomas H. Slavens, constructing quartermaster.

HERINGTON, KAN.—The propostion to issue $40,000 in bonds for improvements to the municipal water and light plants will be submitted to the voters. Burns & McDonnell, Scarritt Building, Kansas City, Mo., are consulting engineers. George F. Brockman is superintendent of the municipal light and water plant.

SCOTT, KAN.—Bids will be received by the city of Scott, Kan., until May 27 for the construction of an electric-light plant and water-works system. The cost of the plant is estimated at about $35,000. The Alamo Engine & Supply Co., of Omaha, Neb., has charge of the engineering work. Charles A. Kilson is Mayor.

Southern States

FORT CASWELL, N. C.—Bids will be received at the office of the constructing quartermaster, Fort Caswell, N. C., until May 26 for the following projects, the government to select the one it considers best for the purpose: (1) For constructing an 8-in. water main, pump house, necessary machinery and power transmission line; (2) constructing an 8-in. water main to the Southport side of the river and furnishing water to the Southport end of the main; (3) for all material, labor, machinery and accessories necessary to install a complete distilling and preliminary water-softening plant, including brick or reinforced-concrete building, and the necessary boiler, tanks, piping and accessories needed to furnish not less than 3000 gal. per hour, or 70,000 gal. daily. For further information apply to James R. Campbell, constructing quartermaster.

NEWTON, N. C.—The Conover Lt. & Pwr. Co. has been granted a franchise to erect transmission lines along the public roads for the distribution of electricity.

WINSTON-SALEM, N. C.—Bids will be received at the office of the supervising architect, Treasury Department, Washington, D. C., until June 2 for extension, including plumbing, gas piping, heating apparatus, electric conduits and wiring and approaches, to the United States post office at Winston-Salem, N. C. Plans and specifications may be obtained at the above office or from the custodian at Winston-Salem. O. Wenderoth is supervising architect.

ABBEVILLE, GA.—The contract for construction of the municipal electric-light plant has been awarded to the J. B. McCrary Co., of Atlanta.

DAWSON, GA.—Bonds to the amount of $12,000 have been voted, the proceeds to be used for the electric-light, water and fire department and for school purposes, etc.

WEST POINT, GA.—The Columbus Pwr. Co., of Columbus, has closed a contract with the Lang Mfg. Co. to furnish electricity to operate its plant. The company will erect a substation in West Point equipped to handle 2500 hp.

JACKSONVILLE, FLA.—The Pine Springs Development Co. has purchased 400 acres of land along the Suwanee River and proposes to develop Pine Springs as a resort. The plans include the construction of a hotel, turbine power plant and sewer system and operation of a 25-mile railroad. The cost of the work is estimated at $250,000. The offices of the company are located at 1009 Bisbee Street, Jacksonville. N. J. Phillips is president.

JACKSONVILLE, FLA.—The electrical committee has decided to recommend to the Board of Bond Trustees the purchase of additional equipment for the municipal electric-light plant, including a battery of boilers with a rating of 1080 hp, to cost $15,000; three transformers of 1000 hp each, to be located in the old water-works plant, at a cost of $8,000; 100 new magnetite-arc lamps for street lighting, costing $4,000, and line regulators for the Riverside section, etc. R. E. Wheeler, Alex R. Merrill and George H. Mason are members of the electrical committee.

WEST PALM BEACH, FLA.—The Ariston Ice & El. Co. is preparing to extend its transmission lines north and south at Palm Beach to furnish electrical service to the residences along the lake shore. The company also proposes to erect transmission lines along the county road to Delray, a distance of 18 miles, to furnish electricity to the towns of Boynton, Lake Worth and Delray and to residences along the route of the line.

PARIS, TENN.—The city has voted to issue $65,000 in bonds for improvements to electric-light plant, sewerage system, schools, etc.

HATTIESBURG, MISS.—The Hattiesburg Trac. Co. has submitted a proposition to the city commissioners for improving the street-lighting system. Under the present contract the company furnishes 70 arc lamps and 26 tungsten lamps. The new proposal provides for the removal of 45 arc lamps and the erection of 135 tungsten lamps, which would give the city 177 tungsten lamps and 31 arc lamps.

CUSHING, OKLA.—The Board of Trustees has accepted the proposition of the Cushing El. Lt. Co. to furnish electricity to operate the municipal water plant at 2 cents per kw-hr.

DURANT, OKLA.—The Texas Pwr. & Lt. Co., of Dallas, Tex., has submitted a proposition to the City Council relative to taking over the municipal electric-light plant and furnishing the city with electricity for lighting purposes.

FORT SILL, OKLA.—Bids will be received at the office of the constructing quartermaster, Fort Sill, Okla., until May 26 for constructing wooden storage tank and installing motor-driven triplex pump with necessary piping. A. U. Faulkner is constructing quartermaster.

INGERSOLL, OKLA.—The town of Ingersoll has been granted a franchise to erect a transmission line from the town of Cherokee to and within the limits of Ingersoll.

MARIETTA, OKLA.—The City Council has engaged the Benham Engineering Co., consulting engineer, 435 American National Bank Building, Oklahoma City, to prepare plans for extensions and improvements to the electric-light and water-works systems.

McCURTAIN, OKLA.—J. N. Taylor and B. A. Little, of Okemah, have purchased one-half interest in the local electric-light plant from the McCurtain State Bank. It is understood that the plant will be thoroughly overhauled and new machinery installed. A street-lighting system will be installed here and in Chant.

FORT WORTH, TEX.—The Fort Worth Lt. & Pwr. Co. has closed a contract with the Bewley Mills to furnish electricity to operate the flour mills. Motors aggregating 600 hp will be installed, varying in size from 300 hp to 7½ hp. The steam plant at the Bewley Mills will be abandoned as soon as the motors are installed. The company has also entered into a contract with the Texas Rolling Mill to supply electricity to the amount of 300 hp to drive electric motors. The steam plant will be discarded.

HOUSTON, TEX.—Bids will be received by Edgar Odell Lovett, president, post office box 17, Houston, Tex., until May 12 for the heating, plumbing and electric work in the two-story physical laboratory of the William M. Rice Institute, Houston. Plans and specifications may be obtained upon application to Cram, Goodhue & Ferguson, Scanlan Building, Houston, for which a deposit of $50 will be required for each set of plans, to be refunded upon return of same.

HUMBLE, TEX.—The power house of the Humble Wtr., Lt. & Ice Co. was destroyed by fire on April 18, causing a loss of about $5,000.

PALESTINE, TEX.—Bids will be received by E. V. Swift, county judge, Palestine, until May 19 for the construction of a court house, including heating, plumbing and wiring systems complete, to be erected in Palestine. Plans and specifications can be secured on application to C. H. Page & Brother, at Austin and Houston, Tex., for which a deposit of $50 will be required to guarantee return of plans.

Pacific States

CHEHALIS, WASH.—H. T. Wilkerson, president of the Hills Harbor Townsite Co., of Portland, Ore., is understood to have options on a large water-power project in the Cowlitz Valley, near Mossyrock, Wash.

PORT ANGELES, WASH.—The city engineer has been instructed to make investigations and secure the cost of machinery for an electric-lighting plant.

TACOMA, WASH.—Plans have been completed by Davis & Hull, electrical contractors and engineers, for installing electrically driven machinery in the large furniture factory of F. S. Harmon & Co. Twenty motors ranging downward from 20 hp will be installed.

HOOD RIVER, ORE.—We are informed that the city of Hood River does not contemplate the installation of a municipal electric-light plant as reported in the issue of April 19. H. L. Howe is city recorder.

LAFAYETTE, ORE.—Bonds to the amount of $10,000 have been voted for the installation of a municipal electric-light plant and water-works system.

PORTLAND, ORE.—The city auditor has been instructed to advertise for bids for lighting the streets of the city and municipal buildings. The present contract with the Portland Ry., Lt. & Pwr. Co. will expire at the end of the year.

BARSTOW, CAL.—The State Railroad Commission has granted the Barstow Utilities Co. permission to sell its electric and ice plant to the Southern Sierras Pwr. Co., of San Bernardino, for $7,000. The Southern Sierras company will enlarge the plant and use it for a sub-station.

CLAREMONT, CAL.—The Citizens' Lt. & Wtr. Co. has applied to the State Railroad Commission for permission to dispose of its property to the Claremont Domestic Wtr. Co. for $78,000.

FRESNO, CAL.—Plans have been submitted to the Board of County Supervisors by the Compressed Air & Machinery Co., of San Francisco, for the construction of a power plant to supply electricity for lamps and motors for the various public institutions, also for heating the court house building and jail. The cost of the plant erected on the court house grounds is estimated at $20,000, and that on the hospital grounds at $26,000.

LIVERMORE, CAL.—The State Railroad Commission has granted the Livermore Wtr. & Pwr. Co. authority to sell its property to the Pacific Gas & El. Co., of San Francisco, for $242,000.

LOS ANGELES, CAL.—Preliminary plans are being made by the Pacific El. Ry. Co. for the construction of an electric railway from Los Angeles to San Diego, a distance of about 120 miles, to cost about $7,000,000.

LOS ANGELES, CAL.—The State Railroad Commission has granted the Pacific Ry. Co. permission to issue $6,930,000 in bonds for improvements and extensions. Of the proceeds $216,968 will be used for light and power plants.

NORDHOFF, CAL.—The Ojar Pwr. Co. has been granted a franchise by the County Supervisors to erect its transmission lines on the highways of the county.

OROVILLE, CAL.—The Great Western Pwr. Co., of San Francisco, has applied for a franchise to erect transmission lines through Butte County.

OROVILLE, CAL.—The Oro El. Corpn., of Oroville, has applied to the State Railroad Commission for a certificate of public convenience and necessity for the sale of electricity on the lands of the Natomas Consolidated in Sacramento County.

REDLANDS, CAL.—Plans are being prepared by the Southern Sierras Pwr. Co., of San Bernardino, for extending its high-tension lines from San Bernardino to Redlands, a distance of 10 miles.

SACRAMENTO, CAL.—At an election held April 19 the proposition to issue $113,000 for the installation of an electrical distributing plant was carried.

SACRAMENTO, CAL.—The House of Representatives has passed bills appropriating $62,000 for improvements to the California Polytechnic School at San Luis Obispo as follows: For heating system, $4,000; for a permanent water system, $33,000; for improvement to school, $10,000, and for equipping power plant for school, $15,000.

SAN FRANCISCO, CAL.—The lighting and rates committee of the Board of Supervisors has voted to allow the installation of an ornamental street-lighting system on Polk Street between Geary and Pacific Streets. Electroliers carrying five-lamp clusters will be erected.

SAN FRANCISCO, CAL.—Application has been made by Captain A. Woodside to the Board of Harbor Commissioners for permission to wire Pier 42 for electricity to operate a conveyor and hoist. If the new system proves satisfactory, Piers 40, 42 and 44, occupied by the Pacific Mail and the San Francisco-Portland lines, will be equipped with electrically driven machinery for loading and unloading vessels. On the recommendation of Chief Engineer Jerome Newman, tungsten lamps will replace arc lamps at the piers from the ferry to and including Pier 27.

GRACE, IDAHO.—The County Commissioners have granted the Utah Pwr. & Lt. Co. permission to supply electricity for lamps and motors in Bannock County. The company has taken over the 25,000-hp hydro-electric plant of the Telluride Pwr. Co., on the Bear River near Grace, and has already secured franchises in Downey, McCammon, Bancroft and Soda Springs.

STREVELL, IDAHO.—A company is being formed for the purpose of building a power plant on Clear Creek to supply electricity for lamps and motors in Strevell. Post office address Naf.

NEPHI, UTAH.—A new waterwheel will soon be installed in the municipal electric-light plant.

SALT LAKE CITY, UTAH.—As soon as the new transmission lines and distributing station of the Utah Pwr. & Lt. Co. are placed in operation all the equipment of the Utah Copper Co. will be operated by electricity. The principal distributing station will be located between Salt Lake and Garfield. D. J. Jackling is president of the Utah Pwr. & Lt. Co.

FORT HUACHUCA, ARIZ.—Bids will be received at the office of the constructing quartermaster, Fort Huachuca, Ariz., until May 23 for construction complete, including plumbing, heating and electric wiring, of three double captains' quarters, troop barracks, additions to buildings Nos. 19, 20 and 30, and installation of sewer system at this post. Plans and specifications may be had on application to the above office and may also be seen at the offices of the chief quartermasters at San Francisco, Cal.; Chicago, Ill., and Fort Sam Houston, Tex., and construction quartermaster at Fort Leavenworth, Kan. For further information address John A. Wagner, constructing quartermaster.

MALTA, MONT.—Arrangements are being made by R. J. Moore, of Glasgow, for the installation of an electric-light plant in Malta, to cost approximately $10,000. The plant will be equipped with a 100-hp gasoline engine and 100-kw generator. The storage-battery system will be used. Tungsten lamps will be used for street lighting. Contract has been awarded for the construction of the power house.

Canada

CALGARY, ALTA.—The Bowness Improvement Co., of Calgary, is receiving bids for two alternating-current generators, to be driven by internal-combustion engines, together with various auxiliary apparatus in connection with same. Specifications may be obtained from T. L. Turnbull, consulting engineer, Calgary.

BERLIN, ONT.—The City Council will soon submit a by-law to the ratepayers calling for an expenditure of $25,000 for extensions and improvements to the municipal electric-light and gas plants.

PETERBORO, ONT.—The Legislature has passed the bill giving the city of Peterboro power to expropriate the plant of the Peterboro Lt. & Pwr. Co.

LANGHAM, SASK.—The ratepayers have approved the by-law authorizing an issue of $12,000 in debentures for the installation of an electric-light plant. The contract for the entire equipment has been awarded to the British Canadian Engineering & Supply Co., of Winnipeg. The equipment will include a Ruston Proctor suction gas engine and gas-producer plant.

Miscellaneous

TANANA, ALASKA.—The Tanana Wtr. & Pwr. Co. is planning a power project in the Tatlanika country, 100 miles from Fairbanks. John L. Timmins is interested in the company.

PANAMA.—Bids will be received at the office of the general purchasing agent Isthmian Canal Commission, Washington, D. C., until May 17 for furnishing dynamite, copper wire, copper brass tubing, bronze steel, steel chain, track bolts, etc. Blanks and general information relating to this circular letter (No. 775) may be obtained at the above office or the offices of the assistant purchasing agents, 24 State Street, New York, N. Y.; 614 Whitney-Central Building, New Orleans, La., and 1086 North Point Street, San Francisco, Cal. Major F. C. Boggs is general purchasing officer.

SAN JUAN, P. R.—Bids will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until June 14 for construction of two 300-ft. steel towers at the naval radio station, San Juan, P. R. The cost of the work is estimated at about $15,000. Plans and specifications may be obtained on application to the above bureau. William M. Smith is acting chief of bureau.

New Industrial Companies

W. H. CHAPMAN & COMPANY, of Detroit, Mich., have been organized by W. H. Chapman and A. T. Barley for the purpose of carrying on a general consulting engineering business. The company proposes to prepare plans, let contracts and supervise the installation of heating, ventilating, illuminating, power transmission and fire protection systems and power plants, etc. The offices of the company are located at 724 Hammond Building, Detroit, Mich.

THE DETROIT TUNGSTEN LAMP COMPANY, of Detroit, Mich., has been incorporated with a capital stock of $10,000 by George W. Harder, Albert W. Marshall and P. H. Willard.

THE IDEAL NOVELTY & LAMP MANUFACTURING COMPANY, of Chicago, Ill., has been chartered with a capital stock of $2,500 to manufacture lighting devices and equipment. The incorporators are: Arthur F. Bond, Oscar J. Bond and Jerome Levinson.

THE RESEARCH COMPANY, of Chicago, Ill., has been incorporated with a capital stock of $100,000 by Forest E. Marsh, Edward E. Gray and L. H. Marsh. The company proposes to manufacture mechanical and electrical devices.

THE SAVAGE NOVELTY COMPANY, of New York, N. Y., has been incorporated with a capital stock of $10,000 by John H. Hawley, Gustav H. Haudte and Robert M. Simpson, 2 Rector Street, New York, N. Y. The company proposes to deal in electrical and other machinery.

THE THOMAS MOTIVE POWER COMPANY, of Newark, N. J., has been incorporated with a capital stock of $125,000 by M. A. Smith, of Newark, N. J.; A. B. Van Liew and J. H. Thomas, of Bloomfield, N. J. The company proposes to manufacture mill supplies and to do an electrical engineering business, etc.

New Incorporations

BIRMINGHAM, ALA.—The National Pwr. Co. has been incorporated with a capital stock of $1,000,000. The officers are: W. W. Wallace, president; M. J. Harper, secretary, and W. B. Burton, treasurer.

EAST ROCHESTER, NEV.—The Rochester Wtr., Pwr. & Mill Corpn. has been incorporated with a capital stock of $500,000 by E. A. Ludwick, J. L. Garner and W. H. Whitmore. East Rochester has not a post office.

NEWARK, N. J.—The Tri-County Pwr. & Trac. Co. has been incorporated with a capital stock of $150,000 to operate electric power plants and traction systems. The incorporators are: George H. Williams, George G. Teller and Wilbur F. Brower. The offices of the company are located at 816 Essex Building, Newark.

HASTINGS, OKLA.—The Hastings Lt. & Pwr. Co. has been incorporated with a capital stock of $6,000 by W. J. Bell, of Hastings; A. M. Bell, of Duke, and S. A. Fowler, of Gould, Okla.

ANAWALT, W. VA.—The Jeanette Lt. & Trac. Co. has been chartered with a capital stock of $10,000. The incorporators are: R. L. Johnson, A. C. Davis, J. J. Stuart and others.

MISHICOT, WIS.—The Mishicot Lt. & Pwr. Co. has been incorporated with a capital stock of $35,000 by Ira Beyer, Rose Beyer and Ahlva Heyroth.

Trade Publications

ELECTRIC-ARC HEAD-LAMPS.—Bulletin A-4061 of the General Electric Company is devoted to electric-arc head-lamps.

CLOTH PINIONS.—The General Electric Company has issued Bulletin No. A4110, which contains data relative to tooth dimensions and instructions for the selection of pinions.

OIL SWITCHES.—Oil switches for small industrial application are treated in Bulletin No. A4113, issued by the General Electric Company. It illustrates and describes type F, forms P3 and P6 oil-break switches.

FIREBRICK.—A complete illustrated catalog of its clay products has been issued by the Evens & Howard Fire Brick Company, St. Louis, Mo. Blast furnace bricks, boiler tiles, patent grate settings and fire-clay chimney tops are described among other clay products.

WIRE PRICE LIST.—The Standard Underground Cable Company, Pittsburgh, Pa., has issued a new price list on Sterling new-code rubber-covered wire. It is published in convenient booklet form, on durable paper. A list of electric wires and cables and cable accessories is included in the booklet.

ELECTROTYPING MACHINERY.—Bulletin No. 241 of the Sprague Electric Works of General Electric Company, New York, has for its subject electric motor drive for stereotyping and electrotyping machinery and refers to special electroplating generators. Some typical installations of this class of machinery are shown.

GUY ANCHORS.—W. N. Matthews & Brother, St. Louis, Mo., are sending out a leaflet containing a reprint from *Telephony* of an article by Mr. Claude L. Matthews on "Predetermination Versus Demonstration," referring to guy anchors. The reprint is accompanied by a leaflet showing by pictures the method of placing Matthews guy anchors.

WATT-HOUR METERS.—In a twenty-page bulletin, No. 35, the Sangamo Electric Company, Springfield, Ill., gives a comprehensive illustrated description of its type "D" and "D 4" two-wire mercury motor watt-hour meters for direct-current circuits. The principle of these meters and their general construction are fully treated. The pamphlet contains considerable information of general interest on its subject matter.

FLEXIBLE COUPLINGS.—Bulletin No. 18, issued by the Francke Company, New Brunswick, N. J., Smith-Serrell Company, Inc., general sales agent, 90 West Street, New York, describes the Francke flexible coupling. This coupling is made in sizes from that suitable for a ¼-in. shaft up to those as large as any in use. It is adapted for steam and gas engines, water and steam turbines, motors, pumps, blowers, printing presses, etc. Special types are made for automobiles and motorboats.

WOOD SUBSTITUTE.—The American Mineral Wood Company, Poughkeepsie, N. Y., has issued a booklet describing the uses for "Eterno," a fireproof and waterproof substitute for wood. It briefly refers to "Eterno" asbestos lumber, asbestos wood, asbestos wall boards, ebony boards and insulating boards and points out the many purposes for which "Eterno" may be used. This product is the invention of Mr. John Ferla, C. E., of Lausanne, Switzerland, where is located the original factory for "Eterno."

HOUSEHOLD DEVICES.—In connection with the general educational advertising campaign on its household specialties, addressed to prospective consumers, the Hotpoint Electric Heating Company, Ontario, Cal., is making a special offer to dealers for "Hotpoint day," May 10. Recent advertising literature addressed to the electrical trade includes a facsimile of a much enlarged telegram in which a special 30 per cent discount offer on "El Tostovo" (electric toaster stove) is made. The reverse side gives a description of this device and tells briefly about the numerous appliances made by this company.

Business Notes

THE GOULD STORAGE BATTERY COMPANY has moved its offices from 341 Fifth Avenue to 30 East Forty-second Street, New York City.

MEYER & JONES.—Mr. Henry C. Meyer, Jr., and Mr. Bassett Jones, Jr., have moved their offices to the Architects' Building, 101 Park Avenue, New York

THE ELECTRIC RAILWAY EQUIPMENT COMPANY has moved its Eastern offices from 90 West Street to 30 Church Street, New York City. Mr. J. G. Kipp will remain in charge of the office.

THE AMERICAN DISTRICT STEAM COMPANY, of North Tonawanda, N. Y., has opened Pacific Coast offices in the Hoge Building, Seattle, Wash., with Mr. Eugene L. Barnes as district manager.

MR. WILLIAM W. RANDOLPH, M. E., has moved his offices to the Woolworth Building, 233 Broadway, New York, where he will continue his consulting engineering practice in matters relating to gas and electric-service properties.

THE CLARK ELECTRIC & MANUFACTURING COMPANY, 149 Broadway, New York, is to furnish the splicing sleeves for use on transmission lines in the Canal Zone. Other orders were received recently by the company for use in India. Another order comes from a power company on the Pacific Coast. This shipment includes tinned copper sleeves for steel ground lines.

Directory of Electrical Associations, Societies, Etc.

ALABAMA LIGHT AND TRACTION ASSOCIATION. Secretary-treasurer, H. O. Hanson, Mobile, Ala.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Secretary, L. O. Howard, Smithsonian Institution, Washington, D. C.

AMERICAN ELECTRIC RAILWAY ACCOUNTANTS' ASSOCIATION. Secretary-treasurer, Matthew R. Boylan, Public Service Railway Co., Newark, N. J.

AMERICAN ELECTRIC RAILWAY ASSOCIATION. Secretary, H. C. Donecker, 29 West 39th St., New York.

AMERICAN ELECTRIC RAILWAY ENGINEERING ASSOCIATION. Secretary, H. C. Donecker, 29 West 39th St., New York.

AMERICAN ELECTROCHEMICAL SOCIETY. Secretary, Prof. J. W. Richards, Lehigh University, South Bethlehem, Pa.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION. Secretary, Dr. J. Willard Travell, 27 East 11th St., New York.

AMERICAN INSTITUTE OF CONSULTING ENGINEERS. Secretary-treasurer, Eugene W. Stern, 103 Park Ave., New York City. The council meets the first Friday of every month.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. Secretary, F. L. Hutchinson, 33 West 39th St., New York. Board of directors meets monthly. Sections and branches in the principal electrical centers throughout the country. Annual convention, Cooperstown, N. Y., June 23-27.

AMERICAN PHYSICAL SOCIETY. Secretary, Ernest Merritt, Cornell University, Ithaca, N. Y.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS. Secretary, W. W. Macon, 29 West 39th St., New York.

AMERICAN WATER WORKS ASSOCIATION. Secretary, J. M. Diven, 271 River St., Troy, N. Y.

ARKANSAS ASSOCIATION PUBLIC UTILITY OPERATORS. Secretary, W. J. Tharp, Little Rock, Ark. Annual meeting, Little Rock, May 5, 6 and 7.

ASSOCIATION OF EDISON ILLUMINATING COMPANIES. Secretary, Geo. C. Holberton, Pacific Gas & Elec. Co., San Francisco, Cal. Annual meeting, Cooperstown, N. Y., Sept. 8.

ASSOCIATION OF IRON AND STEEL ELECTRICAL ENGINEERS. Secretary, James Farrington, Steubenville, Ohio.

ASSOCIATION OF RAILWAY ELECTRICAL ENGINEERS. Secretary-treasurer, Jos. A. Andreucetti, Chicago & Northwestern Railway, Chicago.

ASSOCIATION OF RAILWAY TELEGRAPH SUPERINTENDENTS. Secretary, P. W. Drew, 112 West Adams St., Chicago. Annual meeting, St. Louis, Mo., May 20, 1913.

CANADIAN ELECTRICAL ASSOCIATION. Secretary, C. E. Bowden, Birkbeck Building, Toronto, Ont., Can. Annual convention, Port Arthur, Can., June 23-25.

COLORADO ELECTRIC CLUB. Secretary, C. F. Oehlmann. Meets every Thursday at Albany Hotel, Denver, Col.

COLORADO ELECTRIC LIGHT, POWER AND RAILWAY ASSOCIATION. Secretary, Thomas F. Kennedy, 900 15th St., Denver, Col.

ELECTRIC CLUB OF CHICAGO. Secretary, W. M. Connelly, 1417 Monadnock Block, Chicago. Meets every Thursday noon at Hotel Sherman.

ELECTRICAL CONTRACTORS' ASSOCIATION OF NEW YORK STATE. Secretary, Geo. W. Russell, Jr., 25 West 42d St., New York.

ELECTRICAL CONTRACTORS' ASSOCIATION OF STATE OF MISSOURI. Secretary, Ernest S. Cowie, 1613 Grand Ave., Kansas City, Mo.

ELECTRICAL CONTRACTORS' ASSOCIATION OF WISCONSIN. Secretary, Albert Petermann, Milwaukee, Wis.

ELECTRICAL CREDIT ASSOCIATION OF CHICAGO. Secretary, Frederick P. Vose, Marquette Building, Chicago.

ELECTRICAL CREDIT ASSOCIATION OF PHILADELPHIA. Secretary-treasurer, John W. Crum, 1324 Land Title Building, Philadelphia, Pa. Executive committee meets second and fourth Thursday of each month.

ELECTRICAL SALESMEN'S ASSOCIATION. Secretary, Francis Raymond, 125 Michigan Ave., Chicago, Ill.

ELECTRICAL SUPPLY JOBBERS' ASSOCIATION. Secretary, Franklin Overbagh, 411 South Clinton St., Chicago, Ill. Spring meeting, Chicago, May 26-28.

ELECTRICAL TRADES ASSOCIATION OF CANADA. Secretary, William R. Stavely, Royal Insurance Building, Montreal, Can.

ELECTRICAL TRADES ASSOCIATION OF THE PACIFIC COAST. Secretary, Albert H. Elliot, Harding Building, 34 Ellis St., San Francisco, Cal. Meeting, San Francisco, second Thursday of each month.

ELECTRIC DEVELOPMENT ASSOCIATION, INC. Secretary, Zenas W. Carter, 53 State St., Boston, Mass.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA. Secretary, Harvey Robinson, 124 West 42d Street, New York. Meeting, fourth Tuesday of each month.

ELECTRIC VEHICLE ASSOCIATION OF AMERICA, NEW ENGLAND SECTION. Secretary, L. L. Edgar, 39 Boylston St., Boston.

EMPIRE STATE GAS AND ELECTRIC ASSOCIATION. Secretary, Charles H. B. Chapin, Engineering Societies Building, 29 West 39th St., New York.

FLORIDA ELECTRIC LIGHT AND POWER ASSOCIATION. Secretary, H. C. Adams, West Palm Beach, Fla.

GAS, ELECTRIC AND STREET RAILWAY ASSOCIATION OF OKLAHOMA. Secretary-treasurer, Prof. H. V. Bozell, Norman, Okla. Annual convention, Oklahoma City, May 6-8.

ILLINOIS STATE ELECTRICAL ASSOCIATION. Secretary, H. E. Chubbuck, Peoria, Ill.

ILLUMINATING ENGINEERING SOCIETY. General secretary, J. D. Israel, Engineering Societies Building, 29 West 39th St., New York. Sections in New York, New England, Philadelphia, Chicago and Pittsburgh.

INDEPENDENT ELECTRICAL CONTRACTORS' ASSOCIATION OF GREATER NEW YORK. Secretary, A. Newburger, 1153 Myrtle Ave., Brooklyn, N. Y. Meetings second and fourth Wednesdays, New Grand Hotel, New York.

INDIANA ELECTRIC LIGHT ASSOCIATION. Secretary and treasurer, J. V. Zartman, 120 South Meridian St., Indianapolis, Ind.

INSTITUTE OF OPERATING ENGINEERS. Secretary, L. Houmiller, 29 West 39th Street, New York.

INSTITUTE OF RADIO ENGINEERS. Secretary, E. J. Simon, 81 New St., New York. Meeting, first Wednesday of each month.

INTERNATIONAL ASSOCIATION FOR TESTING MATERIALS. Secretary, H. J. F. Porter, 29 West 39th St., New York.

INTERNATIONAL ASSOCIATION OF MUNICIPAL ELECTRICIANS. Secretary, C. R. George, Houston, Tex.

INTERNATIONAL COMBUSTION ENGINEERS' ASSOCIATION. President, Charles Kratsch, 416 West Indiana St., Chicago. Meeting, second Friday of each month at Lewis Institute.

INTERNATIONAL ELECTRICAL CONGRESS. Secretary, J. A. Barr, Exposition Building, San Francisco, Cal. San Francisco, 1915.

INTERNATIONAL ELECTROTECHNICAL COMMISSION (international body representing various national electrical engineering societies contributing to its support). General secretary, C. le Maistre, 28 Victoria St., Westminster, London, S. W., England. Next plenary meeting, Berlin, Sept. 2-6.

IOWA ELECTRICAL ASSOCIATION. Affiliated with N. E. L. A. Secretary, H. B. Maynard, Waterloo, Ia.

IOWA STREET AND INTERURBAN RAILWAY ASSOCIATION. Secretary, H. E. Weeks, Davenport, Ia.

JOVIAN ORDER. Jupiter (president), F. E. Watts, 239 West 39th St., New York; Mercury (secretary), E. C. Bennett, St. Louis, Mo.

KANSAS GAS, WATER, ELECTRIC LIGHT AND STREET RAILWAY ASSOCIATION. Secretary-treasurer, W. H. Fellows, Leavenworth, Kan.

LOUISIANA ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, W. H. Bower Spangenberg, 625 Poydras St., New Orleans, La. Meets second Thursday of each month.

MAINE ELECTRIC ASSOCIATION. Secretary, Walter S. Wyman, Waterville, Maine.

MINNESOTA ELECTRICAL ASSOCIATION. Secretary-treasurer, F. A. Otto, St. Paul Gas Light Company, St. Paul, Minn.

MISSOURI ELECTRIC, GAS, STREET RAILWAY AND WATER WORKS ASSOCIATION. Secretary-treasurer, F. D. Beardslee, St. Louis, Mo.

NATIONAL ARM, PIN AND BRACKET ASSOCIATION. Secretary, J. B. Magers, Madison, Ind.

NATIONAL ASSOCIATION OF ELECTRICAL INSPECTORS. Secretary-treasurer, Wm. L. Smith, Concord, Mass.

NATIONAL DISTRICT HEATING ASSOCIATION. Secretary, D. L. Gaskill, Greenville, Ohio. Annual meeting, Indianapolis, Ind., May 27-29, 1913.

NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION OF THE UNITED STATES. Secretary, W. H. Morton, 41 Martin Building, Utica, N. Y. Annual meeting, Chattanooga, Tenn., July 16.

NATIONAL ELECTRIC CREDIT ASSOCIATION. Secretary, Frederick P. Vose, 1343 Marquette Building, Chicago.

NATIONAL ELECTRIC LIGHT ASSOCIATION. Executive secretary, T. C. Martin, Engineering Societies Building, 33 West 39th St., New York. Annual meeting, Chicago, June 2-6, 1913.

NATIONAL ELECTRIC LIGHT ASSOCIATION, COMMERCIAL SECTION. Secretary, E. L. Callahan, 29 West 39th St., New York.

NATIONAL ELECTRIC LIGHT ASSOCIATION, EASTERN NEW YORK SECTION. Secretary, R. E. Russell, Schenectady, N. Y.

NATIONAL ELECTRIC LIGHT ASSOCIATION, GEORGIA SECTION. Secretary-treasurer, M. H. Hendle, Augusta, Ga. Annual meeting, Macon, Aug. 14-16.

NATIONAL ELECTRIC LIGHT ASSOCIATION, HYDROELECTRIC AND POWER TRANSMISSION SECTION. Secretary, L. H. Conklin, Scranton, Pa.

NATIONAL ELECTRIC LIGHT ASSOCIATION, MICHIGAN SECTION. Secretary, Herbert Silvester, 18 Washington Boulevard, Detroit, Mich. Annual meeting, Ottawa Beach, Aug. 19-21.

NATIONAL ELECTRIC LIGHT ASSOCIATION, MISSISSIPPI SECTION. Secretary, A. H. Jones, McComb City, Miss.

NATIONAL ELECTRIC LIGHT ASSOCIATION, NEBRASKA SECTION. Secretary-treasurer, S. J. Bell, David City, Neb.

NATIONAL ELECTRIC LIGHT ASSOCIATION, NEW ENGLAND SECTION. Secretary, Miss O. A. Bursiel, 149 Tremont St., Boston, Mass.

NATIONAL ELECTRIC LIGHT ASSOCIATION, NORTHWEST SECTION. Secretary, N. W. Brockett, Pioneer Building, Seattle, Wash. Annual meeting, Seattle, Wash., Sept. 10-12.

NATIONAL FIRE PROTECTION ASSOCIATION. Secretary, Ralph Sweetland, 141 Milk Street, Boston, Mass.

NATIONAL INDEPENDENT TELEPHONE ASSOCIATION. Secretary-treasurer, Richard Valentine, Janesville, Wis.

NEW ENGLAND ELECTRICAL CREDIT ASSOCIATION. Secretary, Alton F. Tupper, 60 State St., Boston, Mass. Directors meet first Wednesday of each month.

NEW ENGLAND STREET RAILWAY CLUB. Secretary, John J. Lane, 12 Pearl St., Boston, Mass. Meets last Thursday of each month.

NEW ORLEANS ELECTRICAL CONTRACTORS' ASSOCIATION. Secretary, S. J.

Stewart, 312 Carondelet St., New Orleans, La. Meetings, second and fourth Tuesday of each month.

New York Electrical Credit Association (affiliated with the National Electrical Credit Association). Secretary, Franz Neilson, 80 Wall St., New York. Board of directors meets second Thursday of each month.

New York Electrical Society. Secretary, G. H. Guy, Engineering Societies Building, 33 West 39th St., New York.

New York Electric Railway Association. Secretary, Charles C. Dietz, United Traction Co., Albany, N. Y.

Northwestern Cedarmen's Association. Secretary, H. H. McKinney, Minneapolis, Minn.

Ohio Electric Light Association. Secretary, D. L. Gaskill, Greenville, Ohio. Annual meeting, Cedar Point, July 15-17.

Ohio Society of Mechanical, Electrical and Steam Engineers. Secretary, Prof. F. E. Sanborn, Ohio State University, Columbus, Ohio.

Oregon Electrical Contractors' Association. Secretary, J. E. Kilkenny, St. John's, Ore.

Pennsylvania Electric Association (State Section N. E. L. A.). Secretary-treasurer, Walter E. Long, 1000 Chestnut St., Philadelphia, Pa.

Railway Signal Association. Secretary, C. E. Rosenberg, Bethlehem, Pa.

Society for Electrical Development, Inc. Secretary-treasurer, Philip S. Dodd, 29 West 39th St., New York. Meeting executive committee, May 13, 1913.

Society for the Promotion of Engineering Education. Secretary, Prof. H. H. Norris, Cornell University, Ithaca, N. Y.

Southwestern Gas and Electric Association. Secretary, H. S. Cooper, 405 Slaughter Building, Dallas, Tex. Annual meeting, Galveston, Tex., May 21-24.

Tri-State Water and Light Association of the Carolinas and Georgia. Secretary-treasurer, J. W. Neave, Salisbury, N. C.

Vermont Electrical Association. Secretary-treasurer, A. B. Marsden, Manchester, Vt.

Western Association of Electrical Inspectors. Secretary, W. S. Boyd, 76 West Monroe St., Chicago, Ill.

Western Red Cedar Association. Secretary, R. L. Bayne, Spokane, Wash.

Western Society of Engineers, Electrical Section. Secretary, J. H. Warder, 1737 Monadnock Block, Chicago. Regular meeting, fourth Monday of each month, except January, July and August.

Wisconsin Electrical Association. Secretary, George Allison, Stephenson Building, Milwaukee, Wis.

Weekly Record of Electrical Patents

UNITED STATES PATENTS ISSUED APRIL 22, 1913.

[Prepared by Robert Starr Allyn, 16 Exchange Place, New York.]

1,059,342. PROCESS FOR REDUCING ZINC OXIDES; C. F. Burgess, Madison, Wis. App. filed Oct. 8, 1909. Electricity heats zinc oxide to temperature of volatilization, simultaneously heats mass of carbon and conducts vapors of zinc oxide into contact with carbon mass.

1,059,348. RESETTING DEVICE FOR HEAT-COILS; F. R. Chapin, Detroit, Mich. App. filed March 23, 1907. For restoring relatively displaced parts of an operated thermal protector; has supporting members for the protector and means for restoring normal relation of the parts upon the application of heat thereto.

1,059,351. ARMATURE; O. F. Conklin, Anderson, Ind. App. filed Nov. 5, 1912. Inner and outer windings, a commutator for each, and a channeled support for one commutator which receives the leads of the inner winding.

1,059,366. PROCESS OF PREPARING FILAMENTS FOR INCANDESCENT LAMPS; W. G. Houskeeper, Philadelphia, Pa. App. filed Aug. 6, 1910. Simultaneously passes differently phased electric currents through different portions of the filamentary material.

1,059,390. ELECTRIC WELDING MACHINE; R. C. Pierce, Cincinnati, Ohio. App. filed Nov. 14, 1912. Plurality of differently shaped swingingly mounted die-carrying horns capable of being selectively moved to operative position.

1,059,397. ELECTRICAL TERMINAL DEVICE; O. S. Schairer, Edgewood Park, Pa. App. filed Aug. 6, 1910. Receptacle with upwardly projecting prongs and a body of mercury in the receptacle partially suspended between the prongs.

1,059,416. SWITCH; T. S. Watson, C. A. Rhine and C. H. Keeney, Milwaukee, Wis. App. filed Jan. 13, 1911. Handle must be moved from the "off" to the starting position before it can be moved to the running position.

1,059,435. ELECTRIC TRANSFORMER; C. E. Campbell, Lynn, Mass. App. filed Nov. 10, 1909. Core with plurality of legs, a primary winding on one leg divided in sections located near end of leg, low-tension secondary on the same leg between sections of primary and a high-tension secondary on another leg of the core.

1,059,451. ARC LAMP; G. Geiger, Munich, Germany. App. filed Aug. 9, 1909. Armature of the solenoid in series acts directly upon upper carbon holder and effects at the same time the movement of the lower carbon holder.

1,059,499. ELECTRIC FURNACE; E. Stassano, Turin, Italy. App. filed Nov. 29, 1912. A circular conical motion is imparted to the axis of the melting chamber.

1,059,505. ELECTRIC-LIGHT BATH OR TREATMENT APPARATUS; R. X. Tuttle, Battle Creek, Mich. App. filed Sept. 13, 1911. Tubular foldable frame rests upon the bathtub.

1,059,529. TELEGRAPH TRANSMITTER; P. P. Dow, Montreal, Quebec, Canada. App. filed Sept. 25, 1911. Means for delivering the impulses representing the dots in the telegraph alphabet is electrically engaged during the period of silence and manually released to effect the dots.

1,059,583. ELECTRIC-CIRCUIT LOCK; D. W. Wilt, San Diego, Cal. App. filed Aug. 26, 1911. For ignition circuits of automobiles, etc.; rocking element with two angular arms, one to close the circuit and the other to be engaged by a rotatable locking means.

1,059,586. FIRE ALARM; A. Allan and T. Bowling, Wellington, New Zealand. App. filed May 11, 1909. Bent tube provided with an offset pocket adapted to hold a quantity of mercury to close circuit through terminals entering the pocket.

1,059,617. SOCKET FOR ELECTRIC LAMPS; G. C. Knauff, Chicago, Ill. App. filed April 22, 1912. Socket with means for anchoring a lamp in one end and a wire terminal plug in its opposite end and contact members carrying current from terminals of plug to terminals of lamp.

1,059,629. INSULATOR; T. M. Platt, Philadelphia, Pa. App. filed June 10, 1911. Has angularly disposed slots and overhanging lugs to receive and hold the wire.

1,059,650. PLUG CONNECTION FOR ELECTRICAL WORK; A. A. Warner, New Britain, Conn. App. filed May 1, 1912. Resilient jaws bent up into triangular form and a protecting case having a chamber of angular form to receive the jaws.

1,059,690. TELEPHONE REPEATER; D. H. Wilson, New York, N. Y. App. filed June 13, 1911. Plurality of coils connected to main line, a transmitter in circuit with the coils, a receiver associated to actuate the transmitter and a coil associated with the first coil and connected with the receiver.

1,059,706. SELECTIVE RELAY; E. R. Brodton, Mobile, Ala. App. filed Aug. 28, 1909. Continuity of the circuit is established by relays in succession up to the relay designed to respond actively.

1,059,717. SAFETY ATTACHMENT FOR ELEVATOR DOORS; R. R. S. Dobson, New York, N. Y. App. filed July 16, 1912. Circuit-controlling devices render it impossible to start elevator until doors have been closed.

1,059,737. INCANDESCENT LAMP; A. S. Knight, Newark, N. J. App. filed May 13, 1909. Filament extends in zigzag form between supporting members in a plane substantially normal to the axis of the arbor of the lamp.

1,059,738. SUPPORT FOR INCANDESCENT-LAMP FILAMENTS; A. S. Knight, Newark, N. J. App. filed Aug. 6, 1910. Support has an intermediate laterally bent portion, and the filament embraces the support at one side of the laterally bent portion and is united thereto at its extremity.

1,059,745. TELEPHONE METERING SYSTEM; E. H. Martin, Webster City, Ia. App. filed March 17, 1911. Spring-actuated meter meechanism is mounted within the shell of the receiver.

1,059,758. TELEPHONE TIME SIGNAL; W. Pothen, Murdock, Minn. App. filed June 10, 1911. Clock at central station and means actuated by its striking mechanism to make and break the circuit to ring the bell at the substation.

1,059,759. ELECTRIC ALARM FOR LOCKS; J. H. Preston, Ottawa Canada. App. filed March 9, 1912. Uses special key which is insulated, so as not to give the alarm; ordinary key, being uninsulated, serves to give an alarm.

1,059,763. RELAY FOR UNDULATORY CURRENTS; E. Reisz, Vienna, Austria-Hungary. App. filed Jan. 30, 1911. Discharge tube containing gaseous medium, with electrodes positioned in said medium; conductivity of space between the electrodes is altered.

1,059,771. SYSTEM OF CONTROL FOR INDUCTION MOTORS; A. Scherbius, Baden, Switzerland. App. filed June 27, 1908. Induction machine and commutator machine with mechanical connection between rotor of induction machine and the commutator and electrical connections from the rotor of the commutator to the stator of the commutator machine.

1,059,772. DRIVING OF SINGLE-PHASE MOTORS; K. Schnetzler, Baden, Switzerland. App. filed March 19, 1910. Stator of one motor is directly attached to the network while other motor obtains suitably varied voltage by means of a transformer.

1,059,786. PROCESS AND DEVICE FOR LIGHTING SUBMERGED ULTRA-VIOLET-RAY STERILIZING LAMPS; P. G. Triquet, Paris, France. App. filed May 9, 1912. Lamps are lighted by a rapid angular motion around their longitudinal axis crossing the mercury mass of the end chambers.

1,059,809. MANUFACTURE OF PERSULPHATES; G. Adolph and A. Pietzsch, Munich, Germany. App. filed Oct. 6, 1910. Undissolved sulphate of an alkali metal is caused to react on a bath of ammonium persulphate.

1,059,835. ELECTRIC SIGNALING DEVICE; G. Christian, Detroit, Mich. App. filed July 8, 1912. Gong construction; hammer is pivoted intermediate to its ends and a resilently mounted armature has an arm engaging the hammer.

1,059,846. ELECTRIC SWITCH; F. C. De Reamer, Schenectady, N. Y. App. filed Nov. 1, 1912. Pivoted pole piece, rotary crank transverse to the pivotal axis of the pole piece, and a spring connecting the crank and pole piece to exert a biasing effect upon the pole piece alternately in opposite directions.

1,059,903. INSULATOR WITH FUSE; K. Pettersen, Sarpsborg, Norway. App. filed May 2, 1912. Insulator with attached fuse plug has a hole in the body of the insulator and a hook is secured in the said hole.

1,059,925. ELECTRICAL DISTRIBUTION SYSTEM; G. Blank, New York, N. Y. App. fiued April 26, 1912. When service circuit is closed an automatic switch acts to disconnect one branch of the feed circuit from the service circuit and to connect the other branch of the feed circuit with the service circuit and a shunt circuit.

1,059,931. TROLLEY WHEEL; M. E. Drake and D. B. Barnett, Bessemer, Ala. App. filed Oct. 17, 1912. Spring arms on trolley pole carry guard disks engaging the opposite flat faces of the trolley wheel.

1,059,944. CALLING DEVICE; F. R. McBerty, New Rochelle, N. Y. App. filed Feb. 27, 1908. Switching mechanism at distant end of circuit is controlled by calling device for purpose of causing switching mechanism to connect the associated circuit with any one of a number of other telephone lines.